SCIENCE

JULY 25, 1952

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

What GENERAL ELECTRIC People Are Saying

T. TROCKI
Knolls Atomic Power Laboratory

HANDLING LIQUID METALS: Liquid metals have singular advantages as heat-transfer agents for certain high-temperature applications in our modern industrial economy.

The basis for the successful handling of chemically active or personally hazardous materials is to contain them in an inert atmosphere and prevent leakage.

Obviously, the success of any such system depends on the use of a structural material which will not be corroded by the contained liquid metal. It is, therefore, fortunate that many of the high-temperature structural materials are compatible with liquid metals as long as proper precautions are taken to purify the liquid metals initially and keep them clean.

Oxygen appears to be the principal contaminant affecting corrosion, and it must be kept to a minimum. In boiler water the oxygen content is controlled by removing the oxygen at low temperature, when it is practically insoluble in water, and depending upon chemical "getters" at high temperature, when any remaining oxygen is released—and is most corrosive.

Oxygen solubility in liquid metals is also temperature dependent, and this is used as the basis for oxygen removal. Getters have also been investigated for liquid metals, but their effectiveness has not been established.

It can be seen from the foregoing that leak-tightness is the most important single requirement for a liquid-metal system. The difficulties resulting from leakage of liquid metal in such a system vary with the liquid metal concerned. Some of the metals—like lithium, sodium, and potassium—burn in air; others—like lead and mercury—are toxic. And any material at high temperature will burn flesh.

Broadly speaking, the development leading to the successful handling of liquid metals has been devoted, first, to gaining an understanding of the limits and control of liquid-metal contamination, with the object of controlling corrosion; and, second, to developing leakproof heat exchangers, pumps, valves, and system auxiliaries.

G-E Review
May 1952

K. H. KINGDON
Knolls Atomic Power Laboratory

MILITARY NUCLEAR POWER: Military considerations frequently demand that a vehicle shall be able to maintain high speed for a long time, and both these requirements are made available by using a concentrated fuel. Nuclear fuel, with its million-fold great concentration of energy over conventional fuels, is a natural for such military applications.

The most important features of a mobile military nuclear power plant are reliability, compactness, and light weight. A great deal of attention is being given to these features in the plants under development. The requirement for a biological shield to contain the dangerous nuclear radiations within the power plant of an inhabited vehicle makes the requirement of light weight a particularly difficult one to satisfy. This is especially so because there is nothing very smart that one can do about absorbing gamma rays, which only can be absorbed by relatively large thicknesses of heavy materials. These thicknesses are of the order of a few feet for materials like water and concrete, and of the order of a few inches for a very heavy material like lead. Fortunately, although the weight of shielding needed for an inhabited vehicle is awkward, it is not prohibitive.

There is also the question of the damage which may be done to the materials in the power plant by the intense nuclear radiations, damage which may be serious enough to cause failure of some component. Extensive investigations are being made of this radiation damage. It appears that neither the unfamiliar materials with which one has to work, nor the effects of radiation on the materials of the plant, is likely to prove to be a prohibitive limitation on the development of mobile military nuclear power.

Harvard Engineering Society
Boston, Massachusetts
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1. This advertisement first appeared more than a year ago.

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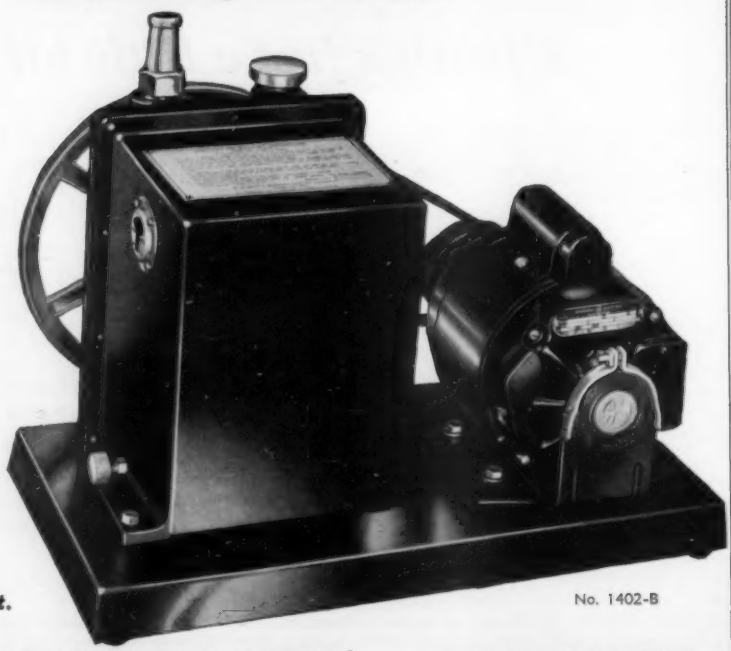

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Time for Cooperation

THERE has never been a time in the history of American education when the schools have not been subjected to criticism. The philosophy, objectives, methods, and all other aspects of our educational system, from earliest schooling through advanced training, have from time to time been under attack from various individuals and groups. Probably no one would question that education at every level has always been capable of improvement. Although much criticism has been purely destructive, the effects of censoriousness have been sufficiently offset by constructive suggestions so that the appraising scrutiny focused upon our schools and their products has, on the whole, been salutary. Only that criticism which is based on such objective data as may be available is likely to be effective in improving the undesirable trends, practices, and conditions that may at any time exist. Starting from known facts is the scientific method of solving problems; this method is as effective in solving educational problems as in solving those of all other fields.

For more than ten years the AAAS has sponsored a Cooperative Committee on the Teaching of Science and Mathematics, the function of which is to seek solutions of important problems that affect the teaching in these two major fields. The Committee is made up of representatives of sixteen scientific organizations. The representatives are university and college teachers of science and mathematics, and in the membership are included three who are now secondary school administrators and a number of university specialists in the teaching of science or mathematics. Because of its broad representation, the Cooperative Committee would seem to be an appropriate agency for bringing together scientists and educators to consider the teaching of science and mathematics in our schools and colleges in a study sponsored jointly by the AAAS and professional education societies. It is obvious, however, that such an undertaking could be successful only if the agency that might assume the responsibility for planning and administering such a study could be assured of the backing and support of the Association and its affiliated scientific organizations.

A cooperating group of scientists and educators might well devote its efforts, first, toward assembling and interpreting the available facts bearing upon the effectiveness of the schools; and then, by identifying objectively the areas and practices that require immediate remedial measures, toward devising appropriate and practicable programs for improvement. Such programs would justifiably embrace measures to ensure adequate training in mathematics and science in the elementary and secondary schools; to secure proper recognition of the place of science and mathematics in general education; to effect adequate provision for the identification and development of those individuals who possess superior scientific aptitude; and to provide optimal programs for training teachers in the fields of science and mathematics at all levels.

The members of the AAAS and the professional educators are alike in their sincere devotion to the cause of improving our educational system, as a fundamental means of building a strong and unified America worthy and capable of world leadership. Would it not be desirable, therefore, for the Cooperative Committee or some other agency designated by the AAAS to sponsor a program providing for the consideration of means of assaying and improving the teaching of science and mathematics, through the joint efforts of scientists and educators?

For the Cooperative Committee,

JOHN R. MAYOR
Representing the Mathematical Association of America

FRANCIS D. CURTIS
Representing AAAS Section Q (Education)

MORRIS MEISTER, *Chairman*
Representing the National Science Teachers Association

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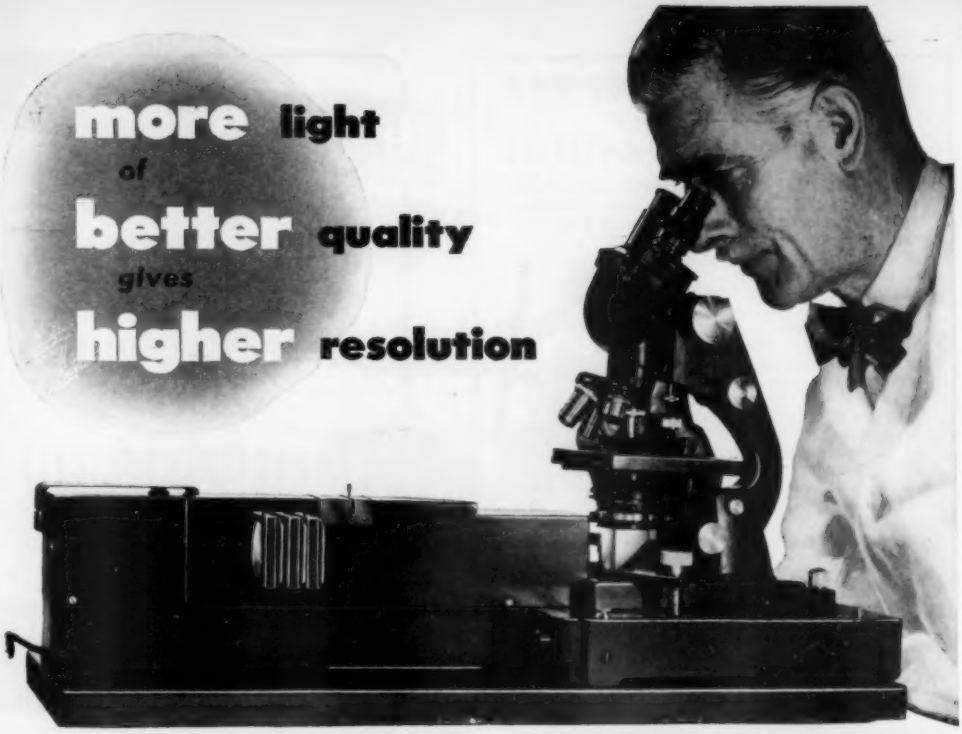

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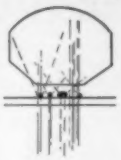

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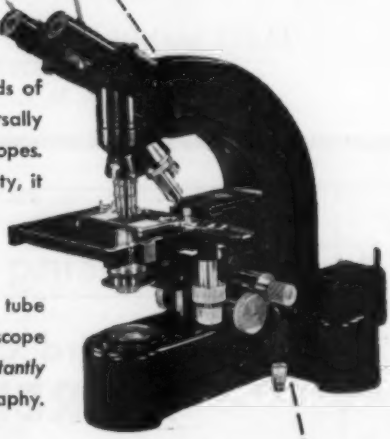

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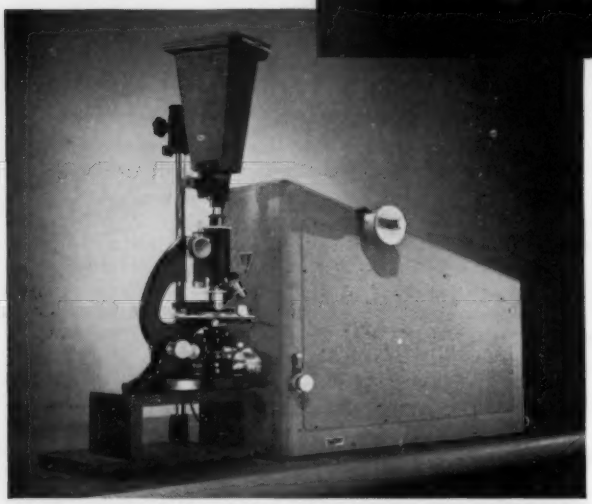

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The Use of the Selective Service College Qualification Test in the Deferment of College Students[1]

Henry Chauncey

Educational Testing Service, Princeton, New Jersey

EXPERIENCE, as Benjamin Franklin pointed out some time ago, keeps a dear school. Certainly as a nation we have paid heavily to acquire the wisdom on which present policies with respect to deferment of college students are based. In the press of immediate military needs during World War II, we lost sight of some important long-range requirements. Now that scientific and specialized personnel are in short supply to an unprecedented degree, and at a time when our technological superiority must be maintained at any cost, it constitutes an expensive lesson to realize that World War II training restrictions are responsible for a considerable measure of the present shortage. Estimates place the deficit attributable to this factor at 100,000 graduates with a bachelor's degree in science and 6000 scientists with the doctor's degree.

The Selective Service regulation which provides that college students high in educational aptitude may be deferred to continue their training is an attempt to avoid repetition of this same costly error during the present emergency. The Selective Service College Qualification Test, designed to implement this regulation, constitutes one means by which high educational aptitude may be demonstrated. Rank in class provides an alternate method. This article summarizes some points of interest in the development of the College Qualification Test and presents some of the findings now available from the first series of administrations in the spring and summer of 1951.

The decision by Selective Service Headquarters to utilize a nationwide test of scholastic aptitude in the draft deferment program, along with rank in class, was based on the recommendations of the six Scientific Advisory Committees, appointed in 1948 by Lewis B. Hershey, director of the Selective Service System. The committees' report, presented by M. H. Trytten, chairman, was made in the early fall of 1950. Shortly thereafter a subcommittee representing civilian and military testing experts prepared general specifications for a test of scholastic aptitude which would be suitable for use as a means of qualifying for deferment. The Educational Testing Service was designated by the subcommittee as the testing agency best equipped to carry out the construction of such a test and its administration on a nationwide scale—provided, of course, that the plans for the student deferment program, at that time still tentative, received final approval.

That the plans were approved, as publicly announced in an Executive Order on March 31, 1951, is a matter of history. Not so well known is the fact that the development of the test had been in progress for some months prior to that date. Realizing that a testing program like the one envisaged would require extensive preliminary preparation, in November 1950 Selective Service negotiated a planning contract with the Educational Testing Service, which provided for the design of test forms and procedures. Only because of General Hershey's farsightedness in authorizing us to proceed with the necessary arrangements while the program was still under consideration was it possible for the first nationwide administration of the SSCQT to be held less than two months after the date of the Presidential Order.

General Hershey's foresight also resulted in increased efficiency of execution of the necessary research studies by making it possible for us to tie the research directly into the operational activities connected with the administration and scoring of the test. From such details as the most appropriate design of the test answer sheets, and the setting aside of a representative sample of papers for detailed analysis, to the fairly complicated procedures involved in obtaining data on college performance for certain candidates and collating these with data on test performance, the advance planning made possible a nicety of integration of research with operational procedures that could not otherwise have been effected.

In the development of the test itself, we proceeded on the basis of directives specifying a test of scholastic aptitude that would yield a single composite score weighted about equally with linguistic and quantitative abilities, that would be composed of items selected for maximum validity in predicting general college achievement, that would have a sufficiently ample time limit so that it was not primarily a speed test, and, finally, that would be equated at two points to the Army General Classification Test. For freshmen, sophomores, and juniors, the passing score on the test (subsequently assigned a numerical value of 70) was

[1] Based on an address presented before the Conference on Scientific Manpower, AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, Philadelphia, Pa., Dec. 30, 1951.

to reflect a level of ability comparable to that represented by a score of 120 on the Army General Classification Test; for seniors, the passing score (subsequently assigned a numerical value of 75) was to be comparable to a score of 130 on the Army General Classification Test.

Following these directives, the staff made plans for a test consisting of 150 five-choice items, about equally divided among those measuring verbal ability and those measuring mathematical or quantitative ability. Some of the verbal ability items were designed to test reading comprehension; others were designed to test understanding of verbal relations. The quantitative ability items were also of two kinds: those drawing upon arithmetic reasoning, and those drawing upon data interpretation, for their correct solution. Detailed plans for standardizing the test and evaluating its effectiveness were also prepared.

The test outline and the standardization and research plans prepared by the staff were then reviewed and approved, with slight modifications, by the Educational Testing Service Standing Committees on Research and on Tests and Measurements, as well as by representatives of the research testing agencies of the Departments of the Army, Navy, and Air Force, and the Selective Service Scientific Advisory Committees. In accordance with the approved outline, test questions were constructed, assembled into trial forms, and pretested on large groups of young men not eligible for deferment. The items chosen for final use were drawn from among many others that had been tried out in this fashion. Since four different forms of the test were required, one for each of the testing dates, additional administrations were necessary to establish score equivalences among the various forms, as well as to establish the comparability between SSCQT scores and Army General Classification Test scores. The procurement of suitable groups of examinees constituted a considerable problem, particularly in view of the time limitations. The assistance of the Air Force Human Resources Research Center, the U. S. Merchant Marine Academy, and the U. S. Military Academy in this respect was most valuable. We are also indebted to the Adjutant General's Office of the Department of the Army for making available to us a restricted form of the Army General Classification Test for purposes of equating the SSCQT to the AGCT.

A total of more than 339,000 candidates took the SSCQT during the first series of administrations in the spring and summer of 1951. About half of these took the test on May 26, and most of the remaining candidates were tested during the next two sessions, on June 16 and June 30. Only a small number—a little over 3000—participated in the administration on July 12, the one non-Saturday testing date established for the convenience of students whose religious convictions prevented their taking the test on a Saturday.

The 339,000 students who were tested approximate 21 per cent of the total number of male college students in the country, estimated at 1,569,000 in the fall

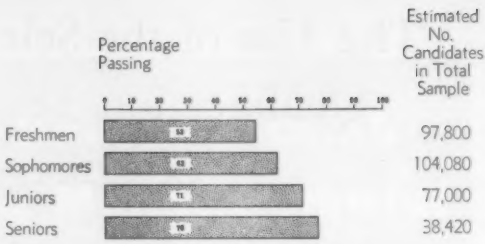

FIG. 1. Percentage of students in each undergraduate year of study achieving a score of 70 or more on the SSCQT. (Based on data for a 10 per cent sample of all candidates tested in the spring and summer of 1951.)

of 1950. More than half the latter total, however, is made up of students who were either ineligible to take the test, or who had no reason to do so. Among these, for example, were some 560,000 veterans. In addition, more than 260,000 of the nonveterans were part-time or nondegree students, and consequently ineligible; also ineligible were an estimated 80,000 nonveterans in the full-time student category who were under 18 or over 26. The total for these three groups comes to more than 900,000; adding in ROTC-deferred students and those classified as 4-Fs brings it to well over 1,100,000, leaving only around 450,000 who were both eligible and not already deferrable on other grounds. Exactly what proportion of the total number of students who might have had something to gain from taking the test actually took it is not possible to determine, but a rough estimate would be between 70 and 80 per cent.

Studies of the test results that have been completed to date are of two types. Those of the first type might be termed demographic, in that they provide information concerning regional differences in test performance, differences among students in various major fields, and the like. These studies have been based on data for a 10 per cent sample of all students to whom the SSCQT was administered, randomly selected within each testing center. Studies of the second type have been concerned with the relationship between test performance and college performance as measured by rank in class, for students at different kinds of institutions and at different stages of their college training. These have been based on data from the May 26 administration for some 5500 students at 23 institutions, selected to represent the kinds of colleges and universities most frequently found in each geographic region.[2] Studies of these two types received high priority because the information they furnished was most important to Selective Service for planning purposes. Other studies of less immediate, but considerable long-range, significance are still in progress and will be reported at some future time.

[2] In the sample of 23 institutions, each major type of college and university was represented in proportion to its number of male graduates in 1947–48; each geographic region was represented roughly in proportion to its male graduates that same year; and the sample was set up by selecting a college or university of the type most often found within a region to represent that region in the sample.

Fig. 1 shows the number of freshmen, sophomores, juniors, and seniors estimated to have taken the test, on the basis of the data in the 10 per cent sample, and the percentage of candidates in each undergraduate year of study who achieved a score of 70 or higher: 53 per cent of the freshmen; 62 per cent of the sophomores; 71 per cent of the juniors; and 76 per cent of the seniors. This increase in percentage equaling or surpassing a score of 70 on the SSCQT seems in large part attributable to progressive dropouts of less able students from the freshmen through the senior year, although some of it may be associated with increased mental maturity. It should be noted that the passing score for seniors was not 70 but 75. Half the seniors in the 10 per cent sample scored at or above 75, which was the critical score necessary for deferment to enter graduate study.

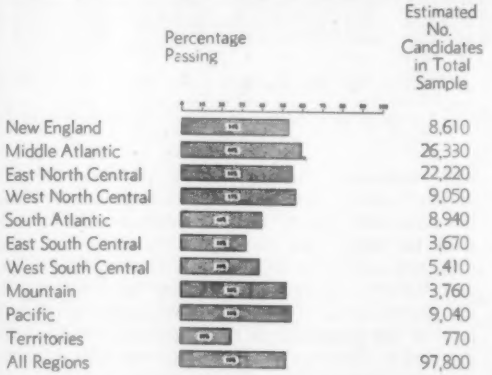

FIG. 2. Percentage of freshmen in each region achieving a score of 70 or more. (Based on data for a 10 per cent sample of all candidates tested in the spring and summer of 1951.)

The differences in performance among students residing in the various geographic regions[3] of the country are rather interesting. Fig. 2 gives the percentage of freshmen in each region who equaled or exceeded a score of 70 on the SSCQT. Despite minor shifts in relative rank order of the various regions, the regional differences in freshman performance are similar to those for sophomores, juniors, and seniors (not shown). In all four comparisons, the percentage of candidates from the New England, Middle Atlantic, East North Central, West North Central, and Pacific regions who passed the test was somewhat higher than that for the country as a whole, whereas the percentage of candidates from the South Atlantic, East South Central, and West South Central regions, and from the territories, who passed the test was appreciably lower than that for the country as a whole. For candidates residing in the Mountain region, the percentage passing was equal to or very slightly below the national average for each year of study.

[3] Geographic divisions utilized were those used by the U. S. Bureau of the Census: *New England*—Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut; *Middle Atlantic*—New York, New Jersey, Pennsylvania; *East North Central*—Ohio, Indiana, Illinois, Michigan, Wisconsin; *West North Central*—Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas; *South Atlantic*—Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida; *East South Central*—Kentucky, Tennessee, Alabama, Mississippi; *West South Central*—Arkansas, Louisiana, Oklahoma, Texas; *Mountain*—Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada; *Pacific*—Washington, Oregon, California; *Territories*—Alaska, Hawaii, Puerto Rico.

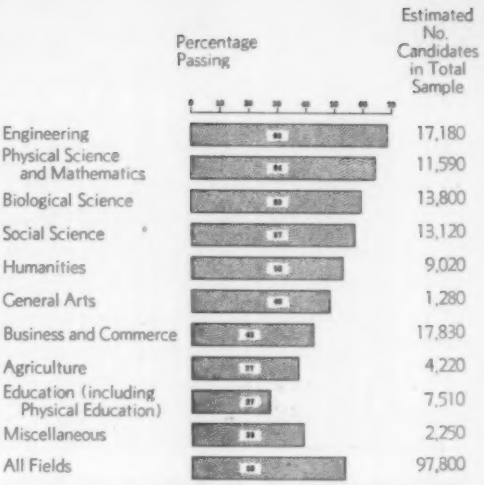

FIG. 3. Percentage of freshmen in each major field of study who achieved a score of 70 or more. (Based on data for a 10 per cent sample of all candidates tested in the spring and summer of 1951.)

Fig. 3 gives data on freshman performance, broken down according to major field of study. The results for sophomores, juniors, and seniors (not shown) are, again, surprisingly similar to those for freshmen. In engineering and in physical science and mathematics, the percentage of candidates passing the test is well above average throughout. Social science is also consistently above average, but not to the same extent. In business and commerce, agriculture, and education (which includes physical education), the percentage passing is well below average in all four comparisons. "Miscellaneous," covering a variety of specialties from carpentry, textile design, and power laundry, through aeronautical administration, law enforcement, and speech pathology, also makes a uniformly poor showing.

The percentage of humanities candidates passing the test remains at or slightly below average in the four comparisons. Like humanities, biological science and general arts appear to be "middle-bracket" fields, although they tend to shift their relative position rather systematically over the four years of study. Biological science, which ranks above social science for freshmen, drops to a position only slightly above that of business and commerce in the senior comparisons. General arts, which ranks below humanities and biological science for freshmen, moves up above both of these to a position just below social science for seniors.

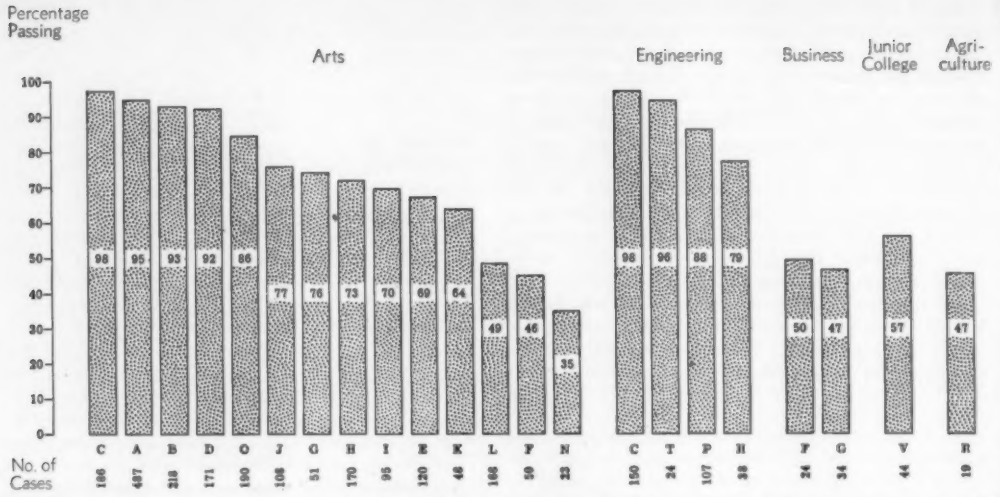

FIG. 4. Percentage of freshmen at various institutions achieving a score of 70 or more. (Based on data for sample of 23 institutions.)

In interpreting the differences among students in various major fields of study with respect to performance on the SSCQT, it should be kept in mind that the test gave equal weight to the linguistic and quantitative aspects of scholastic aptitude. The relative rank order of the several fields might well have changed somewhat if the verbal and numerical aspects of scholastic aptitude had been weighted differently.

The results presented to this point have been based on data for the 10 per cent sample. Those now to be summarized are based on data concerning class standing and test performance for 69 homogeneous groups of students at the 23 selected colleges and universities—i.e., arts freshmen at University A, engineering juniors at University Q, etc. Data for a total of 5527 students—2526 freshmen, 1659 sophomores, and 1342 juniors—were utilized in this analysis. Seniors were not studied.

In advance of the test administration, it was thought that students who met the requirements for deferment on the basis of their rank in class (i.e., the upper half of freshmen, upper two thirds of sophomores, and upper three fourths of juniors) would be less likely to take the SSCQT than students whose rank in class was too low for deferment on that basis, and whose sole opportunity to qualify consequently rested on their test performance. That is not what happened, however. In each year of study, relatively more of those in the upper than in the lower portions of their respective classes took the test. Of the freshmen in the selected samples, 59 per cent were from the top half of their classes, and 41 per cent from the bottom half. Of the sophomores, 73 per cent were in the top two thirds; 27 per cent in the bottom third. Again, 82 per cent of the juniors in the samples studied were in the top three fourths of their respective classes, and 18 per cent in the bottom fourth. The variability among institutions, however, with respect to the percentage of students from the upper and lower portions of their classes who participated in the test, was considerable. Since 23 institutions comprise a relatively small sample, it has seemed best, in arriving at estimates presented later in this paper, to use the theoretical values of 50 per cent of freshmen from the lower portion of their class participating in the test, 33⅓ per cent of sophomores, and 25 per cent of juniors. The obtained percentages, in any event, do not differ significantly from the theoretical ones.

One finding of particular importance emerging from the analysis of data for the 23 institutions is the tremendous variability among these colleges and universities in the percentage of students achieving the critical score on the SSCQT. This finding is in accord with the results of other studies, which have revealed wide variability in test performance among institutions, both throughout the country as a whole and within each geographic region. Fig. 4 shows the percentage of freshmen passing the test in each group consisting of 19 cases or more. At the highest ranking institution, C, 98 per cent of both liberal arts and engineering freshmen passed the test; at the lowest, N, only 35 per cent of the arts freshmen passed. The data for sophomore and junior groups at the various institutions (not presented here) are similar to those for freshmen, although they reveal somewhat less variability. Sophomore and junior groups from institutions that ranked high in the freshmen comparisons continue to stand relatively high; those from institutions that ranked low in the freshmen comparisons continue to stand relatively low.

The institutional differences in performance on the

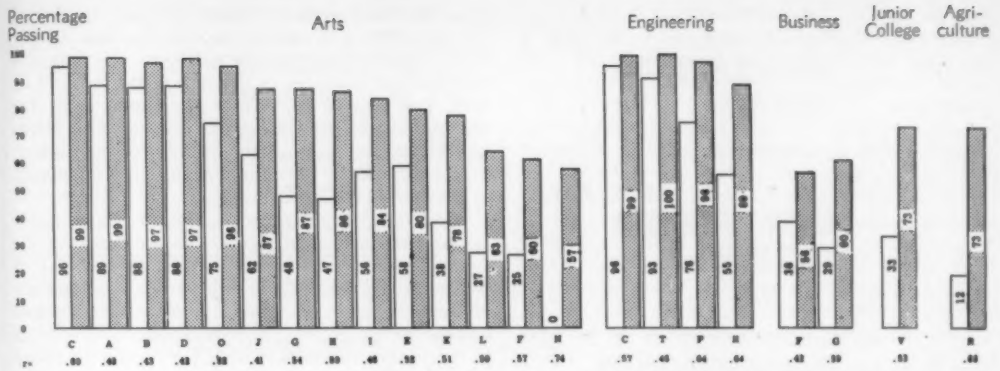

FIG. 5. Percentage of freshmen in upper and lower portions of their respective classes who achieved a score of 70 or more. (Based on data for sample of 23 selected institutions.)

SSCQT are considerably larger, and more consistent, than might be expected on grounds of sampling fluctuation. They reflect marked differences among these colleges and universities in the general level of academic ability of their student bodies. The differences in general level of performance are, in turn, reflected in the number of students from both the upper and the lower portions of their classes at these institutions who passed the test. Fig. 5 gives these data for the same freshman groups that were shown in Fig. 4. As Fig. 5 reveals, more of the high-standing than of the low-standing students in each group achieved the passing score, even though at certain institutions the number who failed comprised only a small fraction of the total. Differences in the percentage of students from the lower portions of their class who passed the test are especially marked. At Institution C, for example, 96 per cent of both arts and engineering freshmen from the lower half of their class passed the test; at Institution N none of the freshmen from the lower half of their class passed.

Values along the bottom row of Fig. 5 are the correlations between test score and rank in class for each group. Despite the wide differences among colleges and universities in caliber of student body, the variation in the correlation coefficients (ranging from .41 to .74) is no greater than would be expected on the basis of sampling fluctuation. In other words, although the passing score set for the SSCQT eliminates widely varying percentages of students at the different institutions, the test itself appears to be as equally good a predictor of freshman grades at one institution as at another.

The same is true for the various sophomore and junior groups studied. The test predicts sophomore and junior performances at any one college or university about as well, within sampling error limits, as at any other. For students at a given stage of training, then, the SSCQT appears to be an equally good predictor of rank in class, regardless of the institution involved. There are, however, differences in the degree to which it can predict performance at different stages of training. Based on data for the 23 institutions studied, it would appear that scores on the SSCQT are somewhat more closely related to performance in the freshman year than in the sophomore or junior year. This is also true of the Scholastic Aptitude Test of the College Entrance Examination Board and of the American Council on Education Psychological Examination. Since data for these two examinations were obtained for the same groups used to study the relationship between the SSCQT and college standing, pertinent figures are available for all three tests. These are summarized in Table 1.

As Table 1 shows, there were six groups of freshmen who took both the SSCQT and the SAT. In these six groups, the average correlation found between SSCQT and rank in class was .52, and the average correlation found between SAT and rank in class was .53. There were thirteen groups of freshmen who took

TABLE 1

CORRELATION SUMMARY

	No. of groups	No. of cases	Average correlation* of rank in class with: Selective Service College Qualification Test	Scholastic Aptitude Test of the CEEB	ACE Psychological Examination
Freshmen	6	1321	.52	.53	—
	13	1001	.53	—	.41
Sophomores	4	609	.47	.52	—
	7	641	.48	—	.34
Juniors	2	562	.37	.41	—
	5	357	.41	—	.33

* Weighted mean z-score transformation.

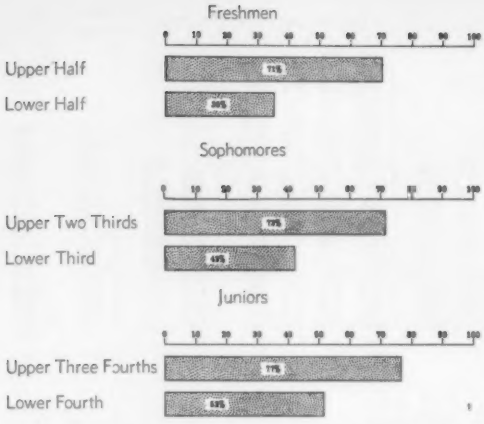

FIG. 6. Percentage of freshmen, sophomores, and juniors in the upper and the lower portions of their respective classes who passed the test. (Based on data for sample of 23 selected institutions, adjusted to conform with known characteristics of the nationwide group.)

both the SSCQT and the ACEPE. In these thirteen groups the average correlation found between SSCQT and rank in class was .53, whereas the average correlation found between ACEPE and rank in class was .41. Analogous data are given for sophomores and juniors. It may be seen from Table 1 that for all three tests the correlations with rank in class tend to decrease somewhat from the freshman to the junior year.

These findings are probably due in considerable part to the increase in the number of elective courses at the more advanced stages of training. Once the freshman year is over, and increasingly so thereafter, the students are no longer running the same race. The grading in some of the elective courses in which few students are enrolled also tends to be somewhat unreliable. In addition, as the less able students are weeded out along the way, difference in ability becomes smaller, which also tends to reduce the correlations.

From a policy point of view, the most important aspect of the relationship between the two measures —SSCQT score and rank in class—is the manner in which they operate together as bases for deferment. Although test performance data were, of course, available for all students participating in the spring and summer administration of the SSCQT, data on rank in class were available only for the students in the 23 selected institutions. Figures showing the joint operation of the two bases for deferment in the country as a whole are, consequently, estimates obtained by adjustment of data for the 23 institutions to conform with known characteristics of the nationwide group with respect to performance on the test. Fig. 6 gives the percentage of students in the upper and the lower portions of their respective classes estimated to have passed the test in the country as a whole, utilizing the theoretical values of 50 per cent of freshmen from the lower portion of their class participating in the test, 33⅓ per cent of sophomores, and 25 per cent of juniors. As revealed in Fig. 6, the estimates are: for the freshmen, 71 per cent in the top half of their class and 35 per cent in the bottom half; for the sophomores, 72 per cent in the top two thirds and 42 per cent in the bottom third; for the juniors, 77 per cent in the top three fourths and 52 per cent in the bottom fourth.

Of obvious importance also, from a policy standpoint, is the joint operation of the two bases for deferment within each region and within each major field of study. By utilizing appropriate combinations of data in Fig. 6 with those presented earlier, and making certain reasonable assumptions, it is possible to derive this information. Fig. 7 gives the estimated number of freshmen in each region who could qualify for deferment on the combined basis of test score and rank in class. The regional differences shown in Fig. 7

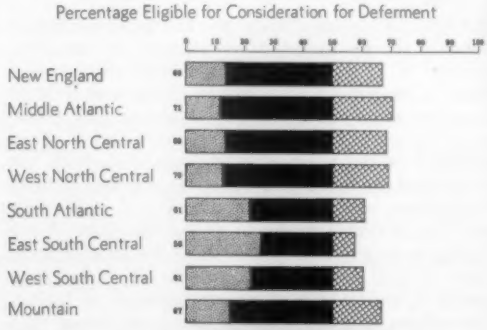

FIG. 7. Percentage of freshmen in each region eligible for consideration for deferment on combined basis of test score and class standing. (Based on combination of data for the 10 per cent sample and the 23 selected institutions.)

are smaller than those shown in Fig. 2, but nevertheless reflect significant variation in the general level of scholastic ability of students in the various regions. Estimates for sophomores and juniors (not shown) follow a similar pattern, although the differences among regions are smaller for sophomores than for freshmen, and still smaller for juniors, because of the increase in percentage of students eligible for consideration for deferment on the basis of rank in class.

Similarly, if we assume that so far as grades are concerned there is no difference among the various major fields, it is possible to estimate the number of students in each field of study who could qualify for deferment on the combined basis of test score and

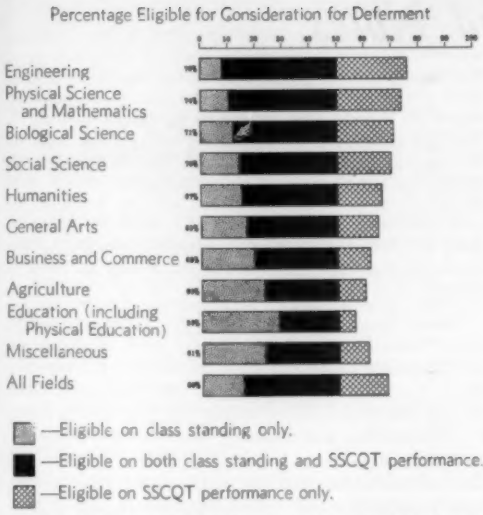

FIG. 8. Percentage of freshmen in each major field of study eligible for consideration for deferment on combined basis of test score and class standing. (Based on combination of data for the 10 per cent sample and the 23 selected institutions.)

rank in class. Fig. 8 gives these estimates for freshmen. It is evident that the high-ranking fields mentioned earlier, engineering and physical science and mathematics, still maintain considerable relative advantage, although the margin has decreased. Education and agriculture maintain their relatively poor status, but again by a smaller margin. Although the differences among the major fields are smaller for sophomores and juniors than for freshmen, the estimates for these two classes (not shown) follow a similar pattern. (In this discussion of the joint operation of the two bases for deferment, within region and within major field of study, I am sure it is understood that it is not mandatory for the local boards to follow the class standing or test score criterion for deferment. At the same time, the individual or his institution has the right of appeal in the event it is felt that the student has been unfairly classified.)

The results that have emerged from the various analyses are clearly in conformity with the rationale on which the original decision to include a test of scholastic aptitude in the draft deferment program was based. As the data presented here reveal, there are tremendous variations among institutions with respect to the general caliber of their students. A student who stands relatively low at one institution may compare very favorably, both in ability and in level of academic performance, with a student who stands relatively high at another institution. Without the correction factor introduced by the test results, individuals from institutions that maintain high standards in the selection of their student body would be unfairly penalized in comparison with those from institutions whose standards are less rigorous.

Within any given institution, also, it would appear from the results given here that the test score supplies information of relevance and importance beyond that afforded by rank in class alone. As indicated earlier, college grades are influenced by numerous factors in addition to the student's level of ability. Differences among students in the level of difficulty of courses chosen, in opportunity for study as affected by demands of self-support and extra-curricular activities, and in value attached to the importance of grades per se are all reflected in college grades, as are differences among instructors in grading standards and in sheer ability to evaluate quality of student performance. Although the test scores, too, are subject to a certain amount of measurement error, they are almost entirely free from the other nonrelevant influences that enter into grades, and therefore provide valuable supplementary data for the purpose at hand.

The findings available to date confirm that the SSCQT effectively serves the purpose of giving capable students everywhere an opportunity to qualify for deferment to continue their training. Further, they augur well for the future operation of the program in still another way. The particular critical scores in use at the present time were selected because they seemed best to meet existing needs. From the studies that have been made, it is apparent that the two measures—rank in class and test score—function with joint effectiveness throughout a wide range. The findings indicate that, if manpower requirements change, appropriate changes in the critical scores can be made without injuring the joint efficiency of the two measures.

In closing, I should like to return to the most important point of all. Students selected for deferment under the college qualification program are permitted to continue their training, not for their own benefit, and not for the benefit of the institutions they attend, but for the benefit of the country as a whole. They are deferred at this time in order that they may be able to serve the military and the country as a whole more effectively later on, after their training has been completed. The basic aim of the program is to select those men whose potential contributions as specialists are of sufficient significance to warrant postponement of their service.

Nevertheless, it is vitally important that a program of this nature be fair to all. Although the draft deferment program was undertaken for the benefit of the nation, and not for that of the individual or the institution, its operating provisions must ensure just treatment for both the individual and the institution. From the analyses that have been made, it would seem that the plan developed by Selective Service with the counsel of the advisory committees appointed by General Hershey was succeeding in this as in the other objectives which it was designed to meet.

News and Notes

Scientists in the News

A. Adrian Albert, University of Chicago professor of mathematics, has been appointed chairman of the Division of Mathematics of the National Research Council. Dr. Albert served on the advisory committee in mathematics to the Office of Naval Research from 1948 to 1951 and is now a member of the divisional committee for the Section on Mathematics, Physics and Engineering of the National Science Foundation.

J. Lewis Allison, professor of plant pathology, North Carolina State College, has accepted an appointment with the Food and Agriculture Organization of the United Nations. He will continue the general survey of plant diseases in Iraq, cooperating with local plant breeders in the development of rust-resistant varieties of wheat, investigating the control of inflorescence rot of the date palm, and assisting in the training of local personnel in plant pathology, including lecturing at the College of Agriculture.

An award of merit has been presented to **Lawrence A. Appley,** president of the American Management Association, by the New York Personnel Management Association, in recognition of his services in the field of personnel relations. Mr. Appley is a member of the President's advisory committee on management and the advisory committee on personnel to the U. S. Atomic Energy Commission.

Oliver J. Caldwell has been appointed assistant commissioner for international education, Office of Education, Federal Security Agency. Mr. Caldwell has served six years with the Department of State, where he developed programs for an educational exchange service with other nations.

M. R. Clarkson has been named administrator of the Agricultural Research Administration, U. S. Department of Agriculture. For the past 15 months Dr. Clarkson has served as special assistant to the administrator on matters of defense. In his new assignment, he will assist **Byron T. Shaw** in directing the activities of ARA, which include the work of six scientific bureaus, the Office of Experiment Stations, and the coordination of all department research other than economic. As deputy, he succeeds Dr. Shaw, who was appointed administrator of the ARA last January.

Harry G. Day has been appointed chairman of the Indiana University Department of Chemistry. He has been acting chairman of the department since 1951, when he replaced **Frank T. Gucker, Jr.,** now dean of the Indiana University College of Arts and Sciences.

Buell Gordon Gallagher, U. S. Assistant Commissioner of Education, has been selected as president of New York City College. Several committees representing the board, the faculty, and the alumni body have sought during the past year for a successor to **Harry N. Wright,** who retired as president on July 1. He has reached the compulsory retirement age of 70 years after 11 years of service. Dr. Gallagher will be the seventh president of the college.

A. Guinier, professor in the Conservatoire des Arts et Métiers, Paris, has accepted an invitation from the University of Illinois for a stay of several months starting in September.

Mount Sinai Hospital in New York has appointed **Alan Guttmacher** its first full-time chief of obstetrics and gynecology. He will head the clinical service and research and education program, which will be housed in the hospital's Klingenstein Maternity Pavilion. Dr. Guttmacher was formerly associate professor of obstetrics at Johns Hopkins Medical School and chief of obstetrics and chairman of the medical executive committee of Sinai Hospital in Baltimore.

Thomas L. Hagan has been appointed chief of the Division of Dental Public Health in the Public Health Service of the Federal Security Agency. Dr. Hagan has been assistant chief of the division and dental consultant for Federal Security Agency Region III, Washington, D. C., since 1950. He succeeds **John W. Knutson,** who has been named chief dental officer.

S. C. Hollister, dean of the Cornell University College of Engineering, has received the Lamme Medal of the American Society for Engineering Education. The award cited the society's retiring president for his "excellent work in stating the functions of engineering education, his efforts in bringing to public notice the need for engineering, for his acknowledged success as a teacher, consulting engineer, research worker and an engineering education administrator." The George Westinghouse Award was presented to **Gordon S. Brown,** of the Massachusetts Institute of Technology. **Arthur Lyman Williston,** retired principal of Wentworth Institute, Boston, received the James H. McGraw Award. **George H. Hood,** professor emeritus of engineering drawing at the University of Kansas, received the society's Engineering Drawing Award.

New York University has named **Thomas C. Kavanagh** professor of structural engineering and chairman of the Department of Civil Engineering. He was formerly professor of civil engineering at Pennsylvania State College and assistant professor at New York University. Dr. Kavanagh has specialized in research concerning bridges and structures.

Lewis Knudson, who taught his first course at Cornell University 44½ years ago, has retired as head of the Botany Department. His teaching career, one of the longest at Cornell, began in 1908 when he instructed a group of graduate students in advanced

plant physiology. In 1912, Dr. Knudson was appointed acting head of plant physiology. A year later the department was combined with the Botany Department under the late Karl W. Wiegand. Dr. Knudson succeeded Dr. Wiegand in 1941.

Russell K. LeBarron, for seven years chief of forest management research at the Northern Rocky Mountain Forest and Range Experiment Station, is being transferred to the California Forest and Range Experiment Station of the U. S. Forest Service. He succeeds **Duncan Dunning,** who retired in 1951.

Ivan D. London, formerly with the Russian Research Center, Harvard University, is now assistant professor of psychology at Brooklyn College.

Edgar W. McElwee has been appointed research associate professor of horticulture, North Carolina State College. Dr. McElwee will go to North Carolina from Mississippi State, where he has been professor of horticulture since 1947.

William H. Milton, Jr., former vice president and atomic power engineer of the General Electric Company, has been appointed superintendent of Virginia Military Institute. Mr. Milton succeeds **Richard J. Marshall,** who is currently on sick leave and who will leave the post this summer after six years as superintendent. The new superintendent, a graduate of VMI in the class of 1920, is now manager of the operating department of the Knolls Atomic Power Laboratory, near Schenectady, which G-E operates for the Atomic Energy Commission.

Alexander M. Moore, senior research chemist for Parke, Davis & Company, has been promoted to laboratory director in organic chemistry. Dr. Moore has been research chemist with Parke, Davis since 1946. His interest has been largely in the field of chemotherapy.

Herbert N. Otis, of Hunter College, has been appointed acting dean of the faculty during the sabbatical leave of Eleanor H. Grady from September 1952, until January 1953. Professor Otis served in the same post from September 1950 to December 1951, when Dean Grady held the position of acting president while Dr. George N. Shuster, president of the college, was in Bavaria as High Commissioner. Appointed to the Hunter College faculty in 1932 as instructor in physics, Professor Otis was chairman of the Physics Department from 1940 to 1950.

Eugene H. Payne, of the Parke, Davis & Company staff, has just returned from a six-month South American tour where, in cooperation with the Peruvian government, he conducted a survey of the incidence of intestinal parasites among residents of the Andes.

Conrad L. Pirani, chief of the Pathology Division, Army Medical Nutrition Laboratory, has joined the staff of the University of Illinois College of Medicine, Chicago, as associate professor of pathology.

Mabel A. Rollins has been appointed dean of the Department of Economics of the Household and Household Management at the New York State College of Home Economics at Cornell University. She succeeds **Helen Canon,** who retired July 1 after 22 years in the post.

H. I. Romnes, director of operations for the Long Lines Department of American Telephone & Telegraph Company, has been appointed chief engineer of AT&T to succeed **Harold S. Osborne,** who is retiring. **A. F. Jacobson,** vice president in charge of operations for the Illinois Bell Telephone Company, replaced Mr. Romnes in the Long Lines post. Dr. Osborne's Bell System career spans 42 years.

Hazel Shortal, Public Health Service nurse officer, has been assigned to assist in the cooperative public health programs in Latin America. In her new job as a staff member of the Institute of Inter-American Affairs, U. S. government Point IV agency operating in Latin America, she will be public health nurse consultant to field health groups. Her headquarters will be at the Washington office of the institute. Miss Shortal has been a PHS nurse consultant since 1946, and was acting director of public health nursing at St. Louis University before entering the Public Health Service. She has also served as nurse consultant and supervisor with the St. Louis City Health Department.

Oscar S. Smith has been appointed director of the U. S. Atomic Energy Commission's Division of Organization and Personnel. Mr. Smith, who has been deputy director of organization and personnel since 1950, succeeds **Fletcher C. Waller,** who has resigned to join the firm of Bigelow-Sanford in New York.

A. E. van Arkel, head of the Inorganic Chemistry Department, Leiden University, will be in Canada for a year as visiting scientist at the National Research Laboratories in Ottawa. Dr. van Arkel is an authority on the preparation of rare metals of high purity, crystal analysis of inorganic compounds, and recrystallization.

H. H. Warner, member of the Standing Committee on Crop Improvement in the Pacific Area, who was formerly with the ECA Special Technical and Economic Mission to Indonesia, is now area adviser to the Far East Division of the Food and Agriculture Section, Mutual Security Agency, Washington, D. C.

J. E. Weaver, professor of plant ecology in the Department of Botany, University of Nebraska, retired July 1 from active teaching after 37 years with the university. Dr. Weaver plans to continue his research and writing. The vacancy will be filled by **Calvin McMillan,** from the Department of Botany, University of California, Berkeley.

George L. Weil has resigned as assistant director of the Reactor Development Division of the Atomic Energy Commission. Dr. Weil intends to become a private consultant in nuclear reactor design and

engineering, dealing particularly in problems of experimental nuclear power plants for industrial and other private organizations. Dr. Weil started in the field of atomic energy in 1940. In 1945 he was appointed to serve as U. S. scientific representative to the joint Canadian–U.K. atomic energy project at Chalk River, Ontario. In 1947 he became a research associate with the General Electric Company in the AEC's Knolls Atomic Power Laboratory, Schenectady. General Electric was subsequently asked to release Dr. Weil for appointment to the Division of Research of the newly formed AEC.

Education

The following have been appointed to the faculty of **California Institute of Technology:** William H. Corcoran (chemical engineering), Francis B. Fuller (mathematics), and James N. Thurston (electrical engineering).

Oak Ridge Institute of Nuclear Studies will continue operation of the Atomic Energy Commission programs under its direction for another five years. Paul M. Gross, vice president of Duke University, is president of the institute, and William G. Pollard is executive director.

The following **Ohio State University** faculty members will retire from active duty this summer: Dana J. Demorest (metallurgy), Wilmer G. Stover (botany), William J. McCaughey (mineralogy), J. Ernest Carman (geology), Faith L. Gorrell (home economics), Ervin E. Lewis (education), and Arthur Salz (economics).

As A. S. W. Rosenbach Fellow in Bibliography for 1952 at the **University of Pennsylvania,** George Sarton, professor emeritus of the history of science, Harvard, will deliver three lectures on "The Appreciation of Ancient and Medieval Science in the Renaissance" Oct. 17, 24, and 31. They will deal successively with medicine, philosophy, and mathematics, and the text will later be published.

William Doyne Collings, of Michigan State, will join the staff of the **University of Tennessee** medical units for the summer quarter. John Raymond Johnson, of the University of Ottawa, will also serve as a visiting professor in the Division of Physiology.

Trinity University and the **Southwest Foundation for Research and Education** will merge staff personnel and laboratory facilities for graduate teaching and scientific research purposes. Joint research by the two staffs is permitted, by agreement, on projects supported in part by outside agencies, as well as those supported internally. Joint staff appointments and sharing of salaries are also provided for.

The **University of Wisconsin** has promoted 104 faculty members for 1952–53. Of the group, the following received the rank of professor: R. H. Bing and Richard H. Bruck, mathematics; William W. Beeman and Hugh T. Richards, physics; Frederick A. Mote, psychology; Warren H. Southworth and Walter A. Wittich, education; Edwin M. Foster, bacteriology; Robert J. Dicke, entomology; Helen L. Allen, home economics; George W. Washa, mechanics; Chester M. Kurtz, clinical medicine; and James A. Miller, oncology.

Grants and Fellowships

March of Dimes funds amounting to $2,395,039 have been allocated for polio research and professional education, to 26 medical schools, hospitals, research institutions, and educational organizations in this country and one in Canada. Johns Hopkins University received $329,375 for virus research under the direction of Kenneth F. Maxcy and Manfred M. Mayer, and $6,018 for research in improved methods of treatment under the direction of John W. Magladery. Other large grants went to Yale, Stanford, Washington University School of Medicine, and the May T. Morrison Center for Rehabilitation, San Francisco.

The **National Science Foundation** has approved 29 additional research grants, totaling $263,535, in the biological and physical sciences. This is the final group of research grants for the fiscal year ending June 30. A total of 98 grants was awarded during the year, to 60 institutions in 35 states and Hawaii. The average grant amounted to $11,032, to run for 1.9 years, or about $5,800 per year. Although primary basis for selection was scientific merit, the foundation is attempting to encourage the development of research activities in small institutions, with the object of increasing research potential and improving the teaching of science at both graduate and undergraduate levels.

The **Public Health Service** has announced a total of $403,333 in 21 grants to aid cancer control projects in hospitals, medical schools, universities, and other nonfederal institutions in 12 states and the District of Columbia. Among the new grants, the Health Insurance Plan of Greater New York received the largest sum—$60,150. Other large grants were $35,073 to Cornell University Medical College for the work of George N. Papanicolaou and John F. Saybalt; $26,500 to the University of California School of Medicine; $25,000 each to the Medical Film Institute of the Association of American Colleges, University of Michigan School of Public Health, and Memorial Hospital (New York). Several of the grants were for research on more effective methods of diagnosing cancer in its early stages; others were for support of professional education for cancer control, cancer epidemiology studies, and investigations of environmental factors that may play a part in causing cancer.

Radioactive Products, Inc., of Detroit, has established a postdoctoral fellowship at the University of Utah for research on the synthesis of C^{14}-labeled steroids.

In the Laboratories

The Air Research and Development Command expects to establish a European Research Office this fall in Brussels. Activity will be of an unclassified nature, mainly in basic research to obtain new information required for future air developments.

Ballistic Research Laboratories has reappointed Theodore E. Sterne chief of the computing laboratory, a position he held from 1945 to 1947. He replaces L. Serle Dederick, who remains as associate director. Werner Leutert has been appointed chief of the Analysis and Computation Branch. This branch, recently formed by reorganization, contains the ENIAC, EDVAC, ORDVAC, and other large calculating machines.

United States Rubber Company has announced the following changes in the development department of Naugatuck Chemical Division: Vadim C. K. Neklutin, assistant manager of process development; Robert M. Greene, group leader of Paracril and synthetic latex development; Robert L. Knapp, group leader of Vibrin and Kralac development; John A. Flickinger, for dispersions and Sealz development; William F. Brucksch, Jr., and E. Leonard Borg as senior group leaders for physical chemical research and applied and developmental research in synthetic rubber, respectively.

Warner-Hudnut, Inc., has appointed the following chemists to the staff of the Quality Control Department: J. Carden, E. Exner, Mrs. M. N. Nolan, W. Shoenfeld, and L. Brazay. R. Petgrave has been transferred to the Department of Pharmaceutical Research.

Meetings and Elections

The **American Association of Candy Technologists** have elected the following officers: president, Justin J. Alikonis; vice presidents, Norman Kempf and V. R. Ciccone; secretary-treasurer, Edward W. Meeker; assistant secretary, Hans F. Dresel.

Under the auspices of the **National Congress of American Indians,** fifty representatives of a dozen Indian tribes met in Brigham City, Utah, in June to outline and analyze tribal needs and formulate action proposals for the improvement of the Indian segment of the population. Although held on the campus of the Intermountain Indian School, the two-week workshop was nongovernmental in nature, and most of the tribesmen paid their own expenses. Contributors to the project include the American Friends Service Committee, the Bureau of Catholic Indian Missions, the Field Foundation, the Phelps-Stokes Fund, the Daughters of the American Revolution, and the Indian Rights Association.

Under the joint sponsorship of the **Society of Protozoologists** and the **New York Academy of Sciences,** a conference on the Growth of Protozoa will be held Oct. 24–25 at the academy. The first day will be devoted to free-living forms, the second to parasites. Papers tentatively arranged for include, among others, descriptions of vitamin assays by means of protozoa utilizing particulate food; studies of the growth requirements of parasitic flagellates, amebae, and malarial organisms; and an electron microscope study of the morphology of photosynthetic flagellates, with special reference to the chloroplast. The proceedings of the conference will be published in the *Annals* of the academy.

Miscellaneous

The **American Geographical Society** will present medals for "superior contribution to the field of geography" to James M. Wordie, president of the Royal Geographical Society, England (Charles P. Daly Medal); George B. Cressey, of Syracuse University, president of the International Geographical Union (George Davidson Medal, first award); Robert Almagiá, of the University of Rome, vice president of the Union (Cullum Geographical Medal); Gilbert H. Grosvenor, president of the National Geographic Society (Samuel Finley Breese Morse Medal); and Carlos Delgado de Carvalho, of the University of Brazil (Livingstone Centenary Medal).

The Hardesty Chemical Corporation has elected **Edward M. Bratter** a director. Mr. Bratter is a partner in the law firm of Marshall, Bratter, Klein & Greene, of New York.

An expedition sponsored by **Columbia University,** the **Office of Naval Research,** the **Bureau of Ships,** and the **Woods Hole Oceanographic Institution** has left New York on the *Kevin Moran,* an especially equipped tug, for exploration of the ocean floor off New England. The nine scientists in the group, led by W. Maurice Ewing, will make seismic refraction measurements and take samples of bottom sediments. They also hope to secure large samples of water from the ocean bottom on both sides of the Atlantic Ridge. Carbon 14 studies of the carbonate extracted from the water will be made at the Lamont Geological Observatory. The *Atlantis,* Woods Hole research vessel, will join the *Kevin Moran* later in the Atlantic cruise.

The **European Council for Nuclear Research** (CERN) held a three-day meeting in Copenhagen during which it adopted a work plan and preliminary budget estimates, based on a survey of the present situation in the various fields of nuclear research. C. J. Bakker, O. Dahl, and L. Kowarski will head the council groups that will prepare a preliminary study on the proposed laboratory for nuclear research, for presentation at the next meeting, to be held in Amsterdam in October. The member states of CERN, which has been set up with the collaboration of Unesco, are: Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Sweden, Switzerland, and Yugoslavia. P. Scherrer is president of the council, F. Perrin and W. Heisenberg are vice presidents, and E. Amaldi is secretary. R. Fry attended the meeting as an official observer from the Royal Society (London).

Technical Papers

Pollen and Radiocarbon Studies of Aleutian Soil Profiles[1]

Svend T. Anderson[2] and Theodore P. Bank, II

Botanical Gardens, University of Michigan, Ann Arbor

Recent studies of soil profiles have provided samples for pollen analysis and radiocarbon dating which will contribute toward a chronology of postglacial events in the Aleutians. The investigations should provide data of correlative value for geology, biology, and anthropology.

Nonarchaeological profiles show alternating layers of humus and ash, with some sand and occasional lenses of a weathered till (Fig. 1). The ash layers record periodic ash eruptions of Aleutian volcanos. Sand layers are usually noticeable only close to the shore, where they may vary in thickness from less than 1 in. to 30 or 40 feet. Glacial till is not always evident, but when occurring it is near the bottom of the profile. A ferruginous band, possibly caused by leaching from above, shows up in the middle soil zone and may prove to be a dependable point of departure for correlation.

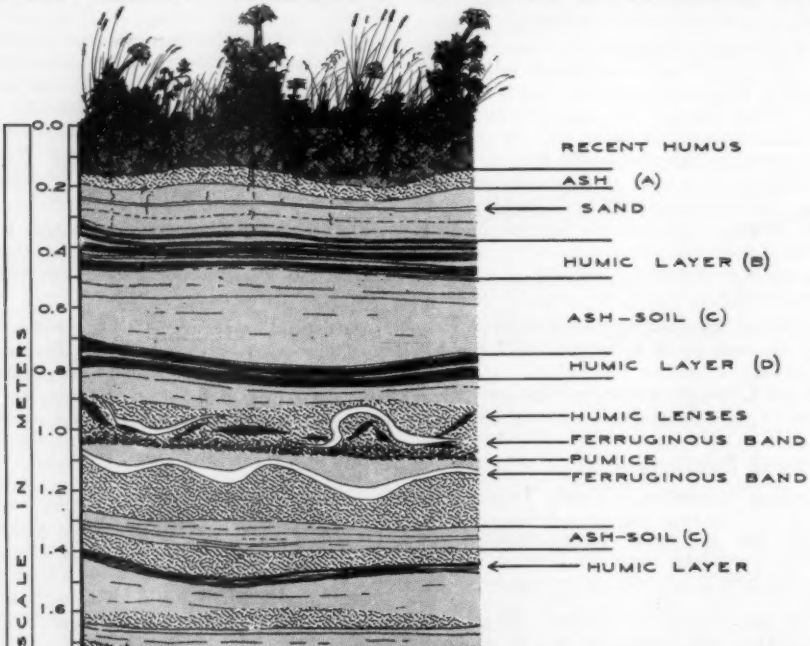

FIG. 1. Nonarchaeological soil profile of a road cut on Tanaga Island, Aleutians. The site is at 75 m elevation, today a *Calamagrostis* meadow. The recent humic layer is approximately 0.2 m thick. Ash (*A*) and other ash layers are pumiceous, sometimes coarse, and of volcanic origin. Humic layer (*B*) contains alternating layers of organic material and ash. Ash soil (*C*) is mainly a weathered silty soil with fine ash, sometimes showing banding. Humic (*D*) layer is at 0.85 m depth. From this layer came sample Tanaga-18. Humic (*E*) layer is at 1.83 m depth. Sample Tanaga-39 came from here. Immediately above it is a layer of pumice and coarse, reddish ash. The clay bed is of a yellow-brown color, sometimes reddish.

[1] Field work was aided by grants from the Office of Naval Research and the Michigan Memorial Phoenix Project. Expeditions (1948–51) were sponsored by the Botanical Gardens and Museum of Anthropology of the University of Michigan.

[2] Present address: University of Copenhagen.

Several hundred samples of humus, ash, till, and charcoal have been collected at varying altitudes from Kodiak, Unalaska, Umnak, Atka, Adak, Tanaga, and Agattu islands. These were taken from freshly exposed profiles of stream banks and road cuts, as well as from archaeological excavations, and were collected with a clean trowel into paper bags. Phytoecological data were also recorded at each site.

Judson (*1*) stated that he found Aleut cultural remains associated with the middle soil zone on Adak. This seems to be borne out by the studies of Bank during the examination of profiles near prehistoric villages on Amaknak and Atka.

In Aleutian archaeological sites, lensing is extremely complicated because of the numerous deposits of clamshell, fishbone, and sea-urchin shell which are seasonal accumulations, sometimes during a thousand years or more of occupation of a single site. However, since humic layers frequently separate cultural horizons in the middens, samples can be obtained for pollen analysis as well as for radiocarbon determination, and these humic strata can be used in conjunction with sometimes discernible ash bands as index layers in the chronology.

Recently published radiocarbon dates for Aleutian middens are very interesting. A date determined at Chicago of about 3020 years was obtained for the lowest cultural remains in a mound excavated by Laughlin on Umnak (*2*), and a shell heap on Adak (no collection data given) was dated at about 4600 years (*3*), indicating that human occupation in the Aleutians has covered a much longer time interval than was anticipated. Dates for Aleutian archaeological sites studied by the Michigan group will be announced soon by the University of Michigan radiocarbon laboratory.

A preliminary pollen analytical investigation of some of Bank's samples has been done by Anderson in order to ascertain whether this method would be applicable to Aleutian soils as opposed to peats and mucks. Altogether three samples were examined, two from a profile at Tanaga, central Aleutians, and one from a profile at Unalaska. Both sites were nonarchaeological. The Tanaga site is at 75 m elevation, today a *Calamagrostis langsdorfii* meadow as described by Hultén (*4*) and Bank (*5*). The Unalaska profile is on a slope at 915 m elevation, today covered by *Empetrum* heath with short grasses and scattered prostrate willows.

The samples were treated with (*a*) potassium hydroxide, (*b*) hydrofluoric acid, (*c*) Erdtman acetolysis mixture, according to the procedure described by Faegri and Iversen (*6*).

The samples are unique because all material is from terrestrial deposits, and the usual expectation would be for all pollen and spores to have been destroyed by oxidation; it was therefore a surprise to find these well preserved and present in ample quantity for statistical analysis. Preservation has probably depended upon the unusual Aleutian climate, marked by constant, high precipitation and low temperature, and constant saturation of the soil with water.

TABLE 1

RESULTS OF POLLEN ANALYSIS OF ALEUTIAN SOIL SAMPLES

	Alnus*	Betula	Populus	Juniperus	Gramineae	Cyperaceae	Ericales	Artemisia	Ranunculaceae	Caryophyllaceae	Geranium	Epilobium	Umbelliferae	Campanula	Achillea	Unidentified pollen	Lycopodium	Dryopteris	Total pollen grains and spores
Tanaga-18																			
0.85 m depth	0.3	—	—	0.3	56	23	3.7	—	9.0	—	—	—	2.2	0.8	—	0.6	0.8	3.1	356
Tanaga-39†																			
1.83 m depth	0.3	0.3	0.3	—	22	2.9	55	—	1.3	—	—	—	0.3	—	—	0.3	17	0.3	309
Unalaska-12																			
0.74 m depth	—	—	—	—	0.7	2.4	—	6.5	—	0.2	0.5	0.3	9.6	0.3	0.3	0.3	—	79	416

* Figures are percentages of the total of pollen and spores.
† From same site as Tanaga-18 but deeper, at 1.83 m below the surface.

The results of the microscopical examination are presented in Table 1. The two samples from Tanaga, one from the lower part, the other from the upper part of the profile, indicate two entirely different plant communities. The older one, with high percentages for *Ericales* and *Lycopodium*, represents the *Empetrum* heath as described by Hultén, but the younger sample indicates a vegetation very similar to the *Calamagrostis* meadow today existing at the place of the profile. The Unalaska profile is peculiar, being completely dominated by a fern, *Dryopteris* sp.

It is indicated that pollen analysis of some strata in the volcanic ash profiles is possible, and that a fuller investigation of selected undisturbed profiles may be expected to enlighten us about many features of the postglacial history of the vegetation of the Islands. Changes are indicated, which could be interpreted as caused by climatic variations. By correlation of samples from the archaeological sites and by radiocarbon dating, a picture should be obtainable of climatic and

living conditions prevailing by the time of the ancient Aleut settlements. This is one chief objective of the current Aleutian project at Michigan.

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Manuscript received February 13, 1952.

The Effect of Insulin Coma on Uropepsin Excretion[1]

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Uropepsin excretion determinations were performed on 10 schizophrenic patients who underwent insulin coma therapy. No patients were included who exhibited gastrointestinal, neoplastic, or other physical diseases that might influence uropepsin excretion. Control periods of at least one week were observed before and after therapy. Comparable studies were obtained with subshock insulin and electroconvulsive treatments. For each determination, the measured urine specimen covered the period of actual therapy, was of about 4 hr duration, and corresponded diurnally to the controls. All specimens were obtained between 7:00 A.M. and 11:00 A.M. Uropepsin determinations were performed according to P. M. West's modification (*1*) of Sylvest's technique (*2*). The results have been quantified in units/hour; the reproducibility of the method is approximately 2%.

The generally irregular and fluctuating, abnormally high concentrations of uropepsin during the control periods conformed to the pattern usually found in schizophrenic psychotics (*3*). The characteristic response to the intramuscular administration of regular insulin was an increase in uropepsin output. The magnitude of this reaction did not correlate with the form of schizophrenia, the dosage of insulin, the stage of insulin treatment, the occurrence of coma, or the duration of therapy. The unit dosage at which the first significant increase in output occurred varied between 40 and 600; that for the maximum increase varied between 80 and 900. The maximal outputs were from 1.5 to 5 times the control levels (Fig. 1), might occur

[1] Reviewed in the Veterans Administration and published with the approval of the chief medical director. The statements and conclusions published by the authors are the result of their own study and do not necessarily reflect the opinions or policy of the Veterans Administration.

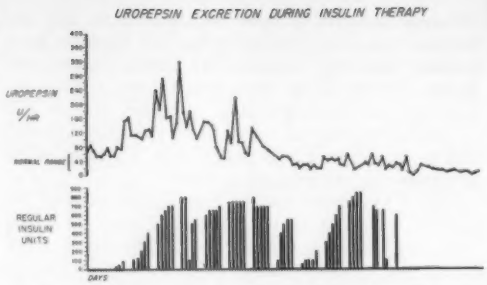

FIG. 1. Effect of regular insulin administration on the excretion of uropepsin. Coma occurred at the 21st dose (650 μ). Note that insulin dosage was deliberately reduced twice thereafter in order to evaluate the effect upon uropepsin excretion.

at any point in therapy, were not sustained, and could not be reproduced with comparable or larger doses of insulin. In those instances in which electroconvulsive therapy preceded insulin coma, and in control studies with electroconvulsive therapy alone, the increase in uropepsin excretion was smaller and evanescent during the electroconvulsive treatments and did not affect the response to insulin.

The problem of quantifying certain adrenocortical functions in schizophrenic psychotics in the resting state, and under the influence of insulin and other physical therapies, proved to be a difficult one until the discovery of what is evidently a simple and quantitative measure of this activity, namely, uropepsin (*4*).

Eosinophil counts taken prior to the injection of insulin and immediately after the termination of each treatment revealed changes which consistently indicated adrenocortical stimulation. Reduction of the number of circulating eosinophils varied from 50% to 90% during insulin therapy (*6*). The stimulating effect of insulin upon adrenocortical activity has been demonstrated by other investigators (*7–10*). Although the mechanism is uncertain, it has been suggested that the release of adrenalin and its effect upon the pituitary-adrenal axis is partially responsible; and this occurs despite the recognized antagonism between insulin and adrenocortical hormone upon the hexokinase system.

The consistent daily occurrence of eosinopoenia in response to insulin administration implies that the concomitantly increased uropepsin excretion during a course of insulin coma therapy furnishes here, as it does under other circumstances (*4*), a quantitative measure of adrenocortical activity. Although the eosinophil count furnishes a satisfactory test of adrenocortical *reactivity*, it does not provide a quantitative measure of the day-to-day fluctuations of adrenocortical function.

Our investigations of adrenocortical function and proteolytic enzyme kinetics have shown a great individual variability in the schizophrenic group and indicate a pronounced tendency toward hyperadrenocorticism and unstable protein metabolism, both at

rest and under physical and emotional stresses. Hence, the observed effects of insulin and electroconvulsive therapies upon uropepsin excretion assume considerable theoretical significance.

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Biosynthesis of the C^{14}-Labeled Form of Dextran[1]

Norbert J. Scully,[2] Homer E. Stavely,[3] John Skok,[2] Alfred R. Stanley,[3] J. K. Dale,[3] J. T. Craig,[3] E. B. Hodge,[3] William Chorney,[2] Ronald Watanabe,[2] and Robert Baldwin[3]

Argonne National Laboratory, Chicago, Illinois, and Research and Development Laboratories, Commercial Solvents Corporation, Terre Haute, Indiana

Dextran is a polysaccharide, made up solely of glucose units, produced by bacterial fermentation of sucrose. Only the glucose portion of the sucrose molecule is utilized in the biosynthetic process. Dextran of suitable molecular size and purity is currently of interest as a synthetic plasma volume expander, particularly for use in event of large-scale catastrophe in which natural blood plasma supplies might be limited. Dextran has been tested clinically with success, but its metabolic fate in the body is inadequately known, since the best analytical procedures account for only about half of injected dextran. It was concluded that these metabolic questions could best be resolved through the use of an isotopically labeled form of dextran.[4]

Argonne National Laboratory and Commercial Solvents Corporation, at the request of the Office of the Surgeon General of the U. S. Army, and under the direction of the Subcommittee on Shock, National Research Council, cooperated in biosynthesizing C^{14}-labeled dextran at two different levels of activity, one designed for use in animal experiments, the other for human clinical experiments. Since 1949 the Research and Development Laboratories, Commercial Solvents Corporation, have conducted a dextran research program and at present have developed a successful clinical grade of dextran. The present report outlines the experimental procedures and results incident to the successful completion of the biosynthesis program.

Essentially, the problem involved the biosynthesis of labeled C^{14} sucrose, followed by the biosynthesis of labeled dextran through fermentation of this sugar. The quantity and absolute activity of labeled dextran required for proposed laboratory and clinical experiments necessitated the handling of approximately 0.3 c of radiocarbon. In order to determine the adequacy of both proposed experimental equipment and procedures, a small quantity of low absolute activity C^{14} dextran was biosynthesized. As soon as these studies were evaluated large-scale biosyntheses were initiated.

C^{14} sucrose was biosynthesized by allowing carbohydrate-depleted, excised *Canna* leaves to photosynthesize in the presence of $C^{14}O_2$ in a 38-liter hermetically sealed, leaf-chamber system.[5] This plant was selected because of its reported high efficiency in converting $C^{14}O_2$ to sucrose during photosynthesis (*1*). A total of 309.7 mc of $C^{14}O_2$ was generated from $BaC^{14}O_3$ in eight experiments employing a total of 30 leaves, weighing 208.8 g fresh. The separate photosynthesis periods varied from 6 to 24 hr and resulted in fixation of 308.0 mc in the leaves, or 99.4% of that generated.

A total of 175.2 mc of C^{14} sucrose was biosynthe-

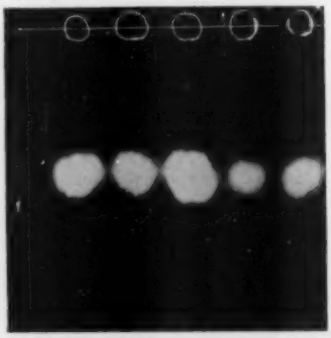

Fig. 1. Radioautograph of paper chromatogram of five separate lots of C^{14} sucrose showing their lack of contamination. Paper partition chromatogrammed for 48 hr at 26° C with BuOH : EtOH : H_2O (45 : 5 : 50) as irrigating solvent. Radioautographed for 30 days using Eastman No-screen x-ray film.

[1] The experimental work was carried out in the Division of Biological and Medical Research, Argonne National Laboratory, under Contract No. DA-49-007-MD-102 between Commercial Solvents Corporation and the Office of the Surgeon General of the U. S. Army. The authors are greatly indebted to Weldon Brown, University of Chicago, and to F. H. Schultz, Jr., Commercial Solvents Corporation, for their interest, encouragement, and counsel. They also acknowledge the able assistance of Lt. Col. E. J. Pulaski, Army Medical Center; Phillip H. Abelson, Carnegie Institution; Walter L. Bloom, Emory University, and A. M. Brues, Argonne National Laboratory, in planning various phases of this project.

[2] Argonne National Laboratory, Chicago, Illinois.

[3] Commercial Solvents Corporation, Terre Haute, Indiana. The following Commercial Solvents Corporation personnel also assisted with various phases of the program: Robert Cundiff, L. R. Jones, and Dona Graam.

[4] The metabolism studies are being conducted by various investigators, at the direction of the Subcommittee on Shock, National Research Council.

[5] The detailed experimental methods utilized for the biosynthesis and isolation of C^{14} sucrose and other plant fractions from Canna leaves are to be presented elsewhere.

sized. A total of 741.8 g of pure carrier sucrose was added to the isolated carbohydrate leaf extracts, utilizing the isotope dilution technique, and 684.9 g of crystalline sucrose containing 168.4 mc was obtained. The average activity was 245.9 μc/g of sucrose, and the average sucrose extraction efficiency was 96.1%. On the basis of the total quantity of C^{14} fixed in photosynthesis, the over-all efficiency in conversion into sucrose was 56.9%. With certain individual leaf biosynthesis runs, the sucrose efficiency was as high as 72.1%. Fig. 1 shows a radioautograph of a paper chromatogram of five separate lots of crystalline C^{14} sucrose and indicates the lack of contamination. Two of the five lots of sucrose were degraded, using enzymatic and microbiological methods (*2*), and were found to be uniformly labeled.[6]

Identical fermentation techniques were employed for the biosynthesis of dextran at each of the two different activity levels—namely, 106.8 μc/g for animal experimentation and 5.68 μc/g for use in human beings. The bacterium *Leuconostoc mesenteroides* was employed in these fermentations. The medium used was that described by Jeanes, Wilham, and Miers (*3*). Fermentations were conducted in 1-, 4-, or 6-liter flasks, containing 300, 3000, or 4000 ml of medium, respectively, sterilized at 116° C for 30 min. Small inoculum cultures used for seeding large-scale C^{14} fermentation flasks were prepared with C^{14}-labeled sucrose, and the entire contents of the culture flask were added equally to each fermentation flask. The fermentation period was terminated during the 26th hour.

Because of the large volumes involved, a total of seven fermentation runs was necessary, five for the low activity level dextran and two for the high activity level material. The native dextran was precipitated from the fermentation beer with methanol. The crude dextran was dissolved in water and reprecipitated with methanol. This was repeated several times more for purification.

For depolymerization the native dextran was subjected to acid hydrolysis, the course of which was followed by determination of viscosity change. The hydrolysates were cooled rapidly, made slightly alkaline with sodium hydroxide, and filtered through a layer of filter aid. The hydrolyzed dextran was fractionated and refractionated from aqueous solution by the addition of methanol, separating the material into three fractions: high molecular weight, intermediate (clinical), and low molecular weight. Wherever necessary the determination of dextran in solution was carried out by the anthrone method (*4*).

In the preparation of the dextran for animal experimentation 303 g of C^{14} sucrose having an absolute activity of 114.7 μc/g was fermented. The clinical fractions from two hydrolyses were reprecipitated together from aqueous solution by the addition of methanol. The dextran was dried, ground to 40 mesh in a Wiley mill and packaged in 1.0 g units. The yield of dry, pyrogen-free dextran of clinical size was 25.3 g containing 2.70 mc of C^{14}. The specifications of the final product are listed in Table 1.

TABLE 1

SPECIFICATIONS OF C^{14} DEXTRAN FOR ANIMAL AND CLINICAL EXPERIMENTS

Characteristic	Dried dextran for animal use	Dextran in solution for human use
Sterility to yeasts, molds, and bacteria	—	Passed
Average dextran concentration, g/100 ml	—	6.06
Viscosity of a 6% solution at 25° C (centistokes)	3.25	2.79
Intrinsic viscosity at 25° C	—	0.20
Mol weight (wt av by light scattering)	126,000*	82,600*
Nitrogen, mg/100 ml	—	0.56
pH	—	5.55
μc/g on solid	106.8†	5.68‡
μc/g based on carbon recovered in combustion	116.8†	6.35‡

* Determined by E. E. Toops, Jr., Commercial Solvents Corporation.

† Assayed by Alexander Van Dyken, Chemistry Division, Argonne National Laboratory.

‡ Assayed by K. E. Wilzbach, Chemistry Division, Argonne National Laboratory.

For the preparation of dextran for human experiments, purified native dextran obtained from the fermentation of 17,800 g of C^{14} sucrose (5.99 μc/g) was hydrolyzed in two batches. Hydrolyses were carried out in twin circular white-enameled laundry tubs, insulated externally, and fitted with glass coils for steam heating and water cooling. All exposed metallic surfaces were coated with Tygon plastic, and the tubs were covered during the hydrolysis with Tygon plastic sheeting. Hydrolysates were pumped through Tygon tubing by means of a glass-lined centrifugal pump into a ceramic filter (diameter, 3 ft) and filtered by suction through a layer of filter aid. Fractionation was carried out as noted above. The final sterile and pyrogen-free product was made up to a 6% dextran solution to which 0.9% sodium chloride had been added. It was bottled in 500-ml units. A total yield of 68 bottles containing 12.58 mc was obtained. The specifications of the final product are listed in Table 1.

Radioactive dextran has been placed in the hands of a number of investigators.[7] Preliminary results definitely indicate that dextran is metabolized by mice, rats, dogs, and human beings, with a substantial portion of the labeled dextran appearing in the expired air as $C^{14}O_2$. One preliminary report has already

[6] The authors wish to thank Martin Gibbs, Brookhaven National Laboratory, Upton, Long Island, N. Y., for conducting the degradation studies.

[7] J. Garrott Allen, University of Chicago Medical School; Walter L. Bloom, Emory University Medical School; Leon Hellman, Sloan-Kettering Institute; Joe Howland and Rodger Terry, School of Medicine and Dentistry, University of Rochester; Surgical Research Unit, Brooke Army Hospital, Fort Sam Houston, Texas; and Harry M. Vars, School of Medicine, University of Pennsylvania.

been published (*5*). Detailed publications will be forthcoming from the various investigators and will appear elsewhere.

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A Dominant, Sex-Linked Mutation in the House Mouse

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Evidence for sex-linked mutations in the mouse has been presented by Hauschka *et al.* (*1*), Chase (*2*), Bittner (*3*), and Strong (*4*). Only one of these reports (*1*), however, involved a morphological mutation. The results of matings of a new dominant mutation in the mouse, Bent-tail (Bn), suggest that this mutation may be sex-linked.

The expression of Bent-tail in the female may range from a single, almost imperceptible kink to a series of well-defined kinks. In some extreme cases, the tail is bent back on itself and may be pressed against the body. In females, the tail is usually normal in length; in males, however, the tail is usually half the normal length, and the kinks are generally restricted to the end of the tail. Except for the kinks and shortness, the tail is apparently normal.

A single Bent-tail male was found in a litter of 7 mice resulting from a mating between a normal female of the Namru strain (*5*) and a bald, hr^{hr}, male (*6*).

TABLE 1

A SUMMARY OF MATINGS OF BENT-TAIL AND NORMAL MICE

Parents		Offspring				
		Bent-tail		Normal		No. of litters
Female (phenotype)	Male (phenotype)	Female	Male	Female	Male	
24-A (+)	24-1 (Bn)	23	0	2*	13	4
24-A (+)	Namru (+)	0	0	7	4	1
Namru (+)	24-1 (Bn)	4	0	0	2	1
Namru (+)	24-1 (Bn)	3	0	0	6	1
Namru (+)	24-1 (Bn)	3	0	0	4	1
130 (+)*	Namru (+)	2	1	3	1	1
131 (+)*	Namru (+)	1	1	3	4	1

* Phenotypically normal, genotypically Bent-tail.

[1] This work was supported in part by a contract between the University of California, Department of Bacteriology, and the Office of Naval Research. The opinions contained in this report are not to be construed as reflecting the views of the Navy Department or the Naval service at large.

This male, 24-1, mated with a normal sib, 24-A, produced Bent-tail females and normal males, suggesting that the mutation was dominant and apparently sex-linked. Two females could not be positively identified as Bent-tail because of the poorly defined single kink. These 2 females when outcrossed to normal Namru males yielded Bent-tail and normal mice. When the original normal female, 24-A, was outcrossed to a normal Namru male, only normal mice resulted. Finally, the original Bent-tail male, 24-1, was outcrossed to 3 normal Namru females. These matings also indicated that the mutation was sex-linked and dominant. The results of all these matings are summarized in Table 1.

The aberrant sex ratio in litters from the original matings between 24-A and 24-1 has been interpreted as being due to a lethal gene in one of the sex chromosomes of the female (*1*). Matings are in progress to test the validity of this hypothesis. Additional matings have been initiated to determine whether homozygous Bent-tail females occur.

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Uraninite from the Grey Dawn Mine, San Juan County, Utah

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Massive chunks of primary uraninite have been found intimately associated with carnotite-bearing ores from the Grey Dawn Mine located on a small tributary of La Sal Creek near the southeast flank of the La Sal Mountains, San Juan County, Utah. This spectacular occurrence of uraninite was brought to the attention of the writer by Ace Turner, operator of the Grey Dawn Mine, when he reported uncovering approximately a thousand pounds of some black ore, "heavy as lead," and assaying about 64% U_3O_8.

Although uraninite has been recognized by Gruner (*1*), Kerr (*2*), and others (*3*) in other sedimentary and igneous rocks on the Colorado Plateau, this discovery is believed the first in carnotite ores from the Salt Wash sandstone member of the Morrison formation, which currently contributes the major proportion of our domestic production. Its presence in these ores may modify the present concept of the origin of the carnotite-bearing sandstone deposits of the Colorado Plateau as interpreted by Fischer (*4*).

A field examination of the mine revealed three pod-like occurrences of uraninite-bearing ore in separate

parts of the mine. The largest pod occurred as a mass 18″–24″ thick by 4′ wide and 10′ long. The massive uraninite, 3″–5″ thick, rested on 6″–8″ of black vanadium ore commonly designated as corvusite. This was followed by 8 or more inches of a yellow carnotite-type ore, which was topped by 6″ of powdery red hewettite.

The specimens of uraninite-bearing ore that have been collected show a black central core of uraninite, in part laced with delicate seams of yellow, orange, and green uranium minerals, and the whole surrounded by carnotite. Although some of these minerals have been tentatively identified, there are many others that have not.

The Bureau of Mines at Salt Lake City, Utah, made a preliminary microscopic and chemical examination of one specimen in August 1951. It consisted of half black oxide and half yellow alteration products. The chemical analysis of the material as a whole gave 66% U_3O_8, 4.8% SiO_2, 7.7% H_2O, and 0.95% copper. There was considerable vanadium present, as well as a minor amount of arsenic. Regarding the identity of the minerals, Harold L. Gibbs states:

> The minerals tentatively identified in this small rich sample are uraninite, beta-uranotil, carnotite, and gummite. An X-ray photograph of the black uranium oxide by Allen King of the University of Utah gave the lines of uraninite. The beta-uranotil was observed as thin 100 plates with parallel extinction, gamma = 1.685, and strong pleochroism, yellow to colorless. Grains in cold concentrated HCl leave a silica residue. Intergrown with the beta-uranotil in all cases was an extremely fine yellow mineral, index more than 1.74, tentatively identified as carnotite because of the presence of vanadium in the same grain. Two yellow isotropic minerals, one of low index near 1.60 and one near 1.73 are tentatively identified as gummite. The nature of the copper and arsenic occurrence was not identified.

Some of these minerals are new to the mineralogy of the carnotite deposits, and it is expected that others will be found and identified by the U. S. Geological Survey following examination of other specimens from this deposit. When the USGS studies have been completed it is believed that there also will be more information on the nature of the uraninite and its alteration products.

The Grey Dawn carnotite deposit is similar in many respects to other carnotite deposits of the Salt Wash sandstone except for the presence of uraninite, gummite, and β-uranotil. It has individual ore pods that are lenticular, irregular in shape, and essentially parallel to the gentle dip of the sandstone bed. Tiny northwest-trending fractures cross the favorable bed in the vicinity of the ore bodies and are believed to be one of the structures influencing the deposition of uraninite. Although there is no surface indication of the Grey Dawn deposit at the rim outcrop, nevertheless some 120′ back of the rim a combination of favorable host rock and structure resulted in forming an ore body.

In the carnotite deposits of the Salt Wash sandstone, no original mineral has ever been found the alteration of which could produce carnotite.[5] The discovery of massive uraninite in the Grey Dawn Mine suggests a source for the uranium, and an unidentified black mineral high in vanadium collected here, as well as in other mines, suggests a source for the vanadium. Not only does the uraninite offer a solution to the origin of carnotite, but it supports the theory that the carnotite-bearing deposits are the product of the alteration of ores of hydrothermal origin. Evidence connecting the deposits with igneous activity is not conclusive, but the presence of the laccolithic La Sal Mountains near the Grey Dawn Mine suggests a close association. The world occurrences of uraninite are listed as associated with heated solutions, and as the Grey Dawn uraninite is not of placer or detrital origin, the possibilities of a hydrothermal origin for the uraninite seem exciting and well worth testing. From the data that are being assembled it appears that a new classification of uraninite-bearing ores is being developed on the Colorado Plateau.

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An Effect of Proteins and Proteoses on the Cellulase of *Myrothecium verrucaria*[1]

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During work on purification of the cellulase of *Myrothecium verrucaria* Alb. et Schw., strain USDA 1334.2, a marked stimulation of cellulase activity by the addition of proteins and proteoses has been observed. Protein effects on enzymes are well known but the present evidence suggests that the mechanism of the effect on cellulase is unusual.

The enzyme preparation ("Fraction 80") on which the effect has been most studied was obtained from a culture filtrate by concentration and repeated fractional precipitation with ammonium sulfate (*1*) and stored as a freeze-dried powder. From subsequent evidence its cellulase content has been estimated to be approximately 40% of the total protein. Enzyme activity was assayed from the micro-Somogyi titer of the reducing sugar formed during incubation of enzyme in 20 ml of assay medium for 17 hr at 35° C, with continuous rotary shaking. The assay medium consisted of a 1% dispersion of cellulose substrate in 0.05 *M* acetate buffer of pH 5.6, with sodium pentachlorophenate as antiseptic. The cellulose substrates have been previously described (*1*): "precipitated cellulose," a finely

[1] Issued as N.R.C. No. 2788.

dispersed, partly degraded cellulose precipitated from sulfuric acid; and "swollen linters," a Wiley-milled cotton linters swollen in alkali under conditions claimed to cause no degradation.

TABLE 1

EFFECT OF PRELIMINARY INCUBATION WITHOUT SUBSTRATE*

Components	Albumin (A) added (μg/20 ml)	Titer: ml 0.005 *N* thiosulfate		
		Precipitated cellulose	Swollen linters	
		pH 5.6	pH 4.8	pH 5.6
E_{24}	0	2.58	1.69	2.11
$E_{24}A_0$	80	4.15	7.04	6.12
	320	5.98	8.29	7.70
$E_{24}A_{24}$	80	4.32	8.17	6.24
	320	6.78	9.19	8.40
E_0	0	4.37	4.28	4.41
E_0A_0	80	6.36	9.52	7.83
	320	7.84	10.12	9.28

* The subscripts denote hours of incubation before substrate addition. Enzyme (E): 78 μg of Fraction 80 protein/20 ml. Titers for precipitated cellulose are for 1 ml of assay medium; for swollen linters, for 3 ml of assay medium.

Evidence of protein stimulation of cellulase activity was obtained while studying the effects of certain adjuvants on the breakdown of precipitated cellulose by a low enzyme concentration (60 μg Fraction 80 protein/20 ml). Cysteine (0.002 *M*) and constituents of the salts in the *Myrothecium* culture medium (dilution 1:40) had no effect on enzyme reducing sugar titer, but Difco Dubos medium serum (dilution 1:1500) approximately doubled it. Controls of substrate and serum alone and of enzyme and serum alone had negligible reducing sugar titers. No effect was given by autoclaved serum, by the fraction of serum not precipitable by 2.5% trichloracetic acid, or by sulfated serum ash, suggesting that serum protein was responsible for enzyme stimulation. Addition of 1 mg of the following proteins gave a similar stimulation: crystalline bovine plasma albumin (Armour), crystalline β-lactoglobulin (Armour), crystalline pepsin (Armour), crystalline lysozyme (Armour), and gelatin (Difco). The nondialyzable fraction of Difco proteose-peptone, a product free of protein on the evidence of precipitation tests, was equally effective. Difco peptone and Difco tryptone had no effect. Thymonucleic acid was also inactive.

Under the above conditions, added protein stimulated enzyme activity toward insoluble substrates only. These included precipitated cellulose, swollen linters, and unswollen linters. Protein addition had no effect on enzyme activity toward cellobiose or the soluble carboxymethyl cellulose (Type 50T, Hercules Powder Co.) whose enzymatic breakdown has been studied by Reese *et al.* (*2, 3*). The effect with insoluble substrates was not peculiar to Fraction 80 but was also shown with an untreated culture filtrate as enzyme source. Stimulation was not significantly affected by dialyzing the enzyme against purified buffers, by purifying or washing the components of the assay medium, or, under sterile conditions, by removing the antiseptic of the assay medium. Trials were made of the effect of added protein on the enzyme during a preliminary incubation, under the same conditions as for assay, in the absence of substrate. The results for 24-hr incubation before substrate addition (Table 1) show that, although the titer of enzyme without added protein was markedly reduced by this treatment (E_{24}, E_0 series), the increase in titer from protein added at the start of the preliminary incubation period was not greatly different from that of protein added at the end ($E_{24}A_{24}$, $E_{24}A_0$ series). With less prolonged periods (17 hr) the differences were still less. It was concluded that the effect of added protein was not primarily due to a protection of the enzyme against denaturation or against an inhibitor present in the assay medium or the enzyme preparation.

For a given level of added protein, the extent of cellulase stimulation depended on at least four factors. (1) It varied with pH (Fig. 1), the variation for higher protein levels being sufficient to change the apparent pH optimum of the enzyme for both precipitated cellulose and swollen linters. This change did not appear to depend on the isoelectric point of the protein added, for, with both substrates, the curves for lysozyme (100 μg) from pH 4.0 to 7.2 and for pepsin (1 mg) from pH 5.6 to 7.2 were closely similar to curve 3 for albumin. (2) Stimulation varied with temperature, the percentage stimulation by albumin at 27° C being more than double that at 35° C with both substrates. (3) Percentage stimulation increased with increasing substrate concentration (Fig. 2), the increase continuing beyond a substrate level (1%) which, in the absence of added protein, was rate-limiting only for high enzyme concentrations. (4) Stimulation decreased with increasing enzyme concentration, an effect which was possibly due to a sparing action by noncellulase protein in the enzyme prepara-

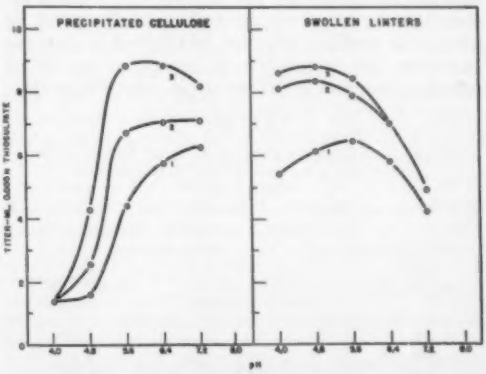

FIG. 1. Effect of pH on cellulase stimulation by albumin. Enzyme: 78 μg Fraction 80 protein. Albumin: curve 1, 0; curve 2, 60 μg; curve 3, 240 μg. Buffers: pH 4.0–5.6, 0.05 *M* acetate; pH 6.4–7.2, 0.025 *M* phosphate. Titers: precipitated cellulose, per 1 ml of assay medium; swollen linters, per 3 ml assay medium.

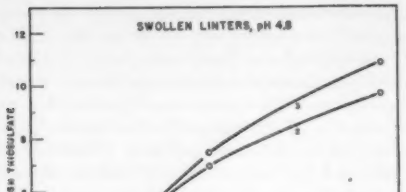

FIG. 2. Effect of substrate concentration on cellulase stimulation by albumin. Enzyme: 66 μg Fraction 80 protein. Albumin: curve 1, 0; curve 2, 56 μg; curve 3, 220 and 440 μg. Buffer: 0.05 *M* acetate. Titer: per 3 ml assay medium.

tion. These effects may explain the present confusion in the literature (*4*) on such properties of crude cellulase preparations as pH optima for different substrates.

Evidence that added protein was partially adsorbed on the substrate was obtained as follows. Before enzyme addition, albumin and substrate (400 mg) were incubated in 19 ml of assay medium for 1 hr and then centrifuged until the volume of the sediment was less than 10% of the total volume. The supernatant solution was replaced by fresh buffer, and the enzyme titer in the resulting medium compared with that in uncentrifuged controls. The titers for precipitated cellulose at pH 5.6 (Table 2) corresponded to about 50% retention of protein by the centrifuged substrate; for swollen linters they were less, corresponding to about 25% retention.

The present data are considered to suggest that cellulase stimulation by protein is due to protein adsorbed on the substrate. A mechanism dependent on adsorption would, as required, be confined to insoluble substrates and be sensitive to low concentrations of added protein and to differences in substrate properties. It also permits a simple interpretation of the effect of increasing the substrate concentration, for this would increase the extent of adsorption. However, no conclusive evidence has yet been obtained to indicate the manner in which adsorbed protein exerts its effect.

TABLE 2

EFFECT ON PROTEIN STIMULATION OF REMOVAL OF ALBUMIN UNADSORBED ON PRECIPITATED CELLULOSE*

Albumin added (μg/20 ml)	Titer: ml 0.005 *N* thiosulfate/ml assay medium	
	Control series (uncentrifuged)	Centrifuged series
450	9.07	8.65
220	8.75	8.17
110	8.03	7.45
55	7.61	6.18
28	6.28	5.86
0	4.63	—

* Enzyme: 68 μg Fraction 80 protein.

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Selective Stimulation of Color Receptors with Alternating Currents

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A sensation of flickering phosphenes is aroused by an alternating current passing through the head. With this sensation as an index, much work has been done to determine threshold strengths of currents as a function of frequencies (*1–5*). Two examples of strength-frequency curves obtained in our laboratory are illustrated in Fig. 1. In these experiments the stimulating

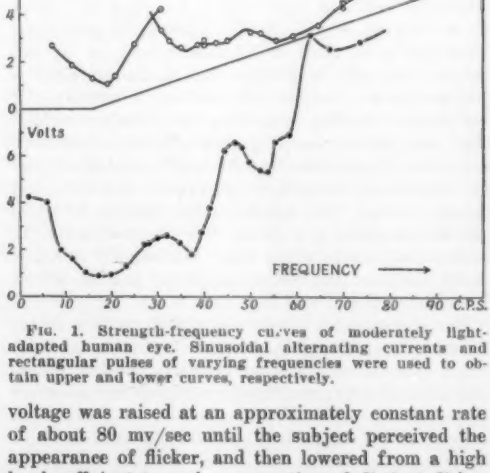

FIG. 1. Strength-frequency curves of moderately light-adapted human eye. Sinusoidal alternating currents and rectangular pulses of varying frequencies were used to obtain upper and lower curves, respectively.

voltage was raised at an approximately constant rate of about 80 mv/sec until the subject perceived the appearance of flicker, and then lowered from a high level sufficient to evoke a sensation of distinct flicker until the subject noticed the disappearance of flicker. The average of both values was taken as the threshold strength.

In another series of experiments a constant voltage

was applied for a period of 0.5 sec instead of increasing or decreasing the voltage during stimulation; starting at sufficiently high level, the voltage was lowered step by step until the subject could no longer distinguish the stimulus in question from one far below the threshold. This second method loses in time, but gains in accuracy, because it is much easier for the subject to distinguish the slightest flicker from the background of intrinsic light of the eye, by virtue of the comparison possible. A strength-frequency curve determined by this method is shown in Fig. 2, in which two sets of data obtained from the same subject on different days are represented by different marks (solid and empty circles).

The minimum at about 20 cps, which is most conspicuous in the curves in Fig. 2, has been observed by all previous investigators, but the other minima, except the one at about 35 cps, have never been noticed, probably because points determined were not numerous enough or the accuracy of measurement was not sufficient to find such minima. Meyer-Schwickerath (*6*) obtained a curve having a single minimum situated at around 20 cps, by using flickering sensations located in the periphery of the retina. He maintained that, based on this fact, the minimum at about 20 cps is concerned with the rod mechanism. This view was supported by Abe (*5*) from the effect of dark adaptation upon this minimum. Taking flickers appearing in the central part of the retina as the index, Meyer-Schwickerath obtained another curve having a single minimum at about 33 cps, which may be identified with the minimum located at about 35 cps in our curves.

The question as to whether these minima of strength-frequency curves are due to different excitabilities of retinal receptors is important and interesting. It seems difficult, however, to answer this question from data of strength-frequency curves alone without resort to any other evidence. In the present investigation, therefore, we approached this question from quite a different angle, making use of the method reported by Motokawa in his previous paper (*7*). The method is based on the fact that, following a brief illumination, the excitability of the dark-adapted eye as tested by a single constant current pulse of 0.1 sec duration recovers along a time course characteristic of the wavelength of the light used for preillumination. Examples of excitability curves obtained by this method are shown in Fig. 3. Each point of these curves was determined by the second method mentioned above; the accuracy of measurement was such that the standard deviation of 10 measurements was 1.3% of the mean value on a skilled subject and 10–15% on untrained subjects.

When white light is used, the excitability reaches a maximum in about 2 sec (broken curves in *C* and *D*, Fig. 3). The maximum of the excitability curve for yellow light lies at about 1.5 sec (*A*), and that for blue light at about 3 sec (*B*). When the eye is exposed to blue light (470 mμ) and then to white light, and the electrical excitability is measured as usual

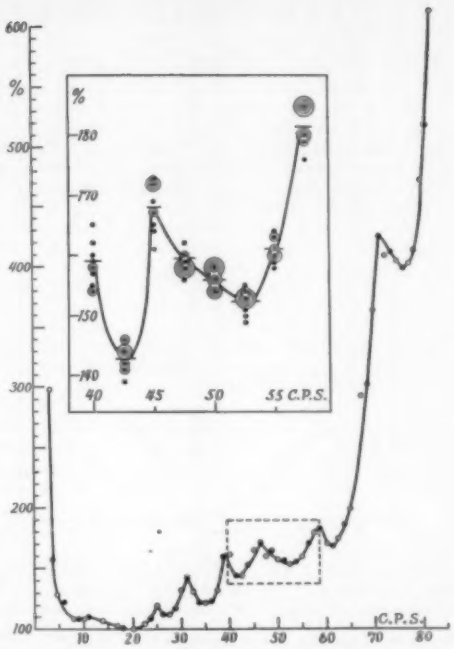

FIG. 2. A strength-frequency curve obtained from a skilled subject. Threshold voltages are expressed in percentage of the threshold at 20 cps. Only a small area of the fovea and parafovea was light-adapted. Intensity of adapting light was five times threshold intensity at fovea. In order to illustrate accuracy of measurement, a part of the curve enclosed by a broken rectangle is represented on a larger scale in the inset, in which 10 values for each frequency of A.C. are plotted, the number of concentric circles indicating how many times the same value was reproduced.

after removal of the white light, then a curve is obtained which resembles neither that for blue nor that for white light, but that for yellow light. The successive stimuli, blue and white, are thus equivalent to yellow light alone. In a similar manner, it can be shown that successive stimuli, yellow and white, are equivalent to blue light (*cf.* *D* and *B*). The curves for successive stimuli, colored and white, are generally much higher than the curve for white light alone, but they cannot be regarded as representing simple summation of the effects of both stimuli, because from this point of view it would be impossible to account for the location of the maximum which corresponds to that of the curve for the complementary color. As a matter of fact, this phenomenon represents the physiological counterpart of the well-known psychological phenomenon, successive color contrast, and is termed "retinal color induction" (*8*).

It was found that an alternating current of 36 cps slightly above threshold could be used as a substitute for the blue light in the experiment on retinal induction stated above; when the white light was preceded by an A.C. of 36 cps lasting for 0.5 sec, we obtained an excitability curve having a maximum at about 1.5 sec,

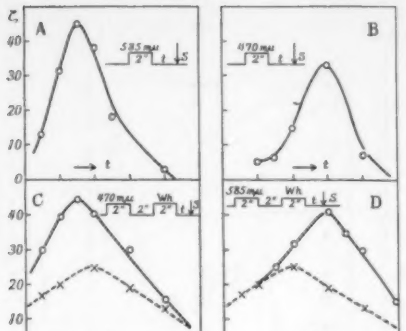

FIG. 3. Retinal induction caused by colored lights and by alternating currents. Ordinates: percentage increases of electrical excitability of the eye over resting level after 2 sec illumination. Abscissas: time in seconds from the end of preillumination. Procedure for experimentation is shown in insets in which *Wh*, *S*, and *t* denote white light, an electric stimulus (that is, a single pulse of 0.1 sec), and the interval between *Wh* and *S*, respectively. *A*, response to yellow light; *B*, response to blue light; *C*, solid curve, response to successive stimulation of yellow and white light; *D*, solid curve, response to successive stimulation of blue and white light; *E*, solid curve, response to successive stimulation of 36 cps A.C. and white light; *F*, solid curve, response to successive stimulation of 55 cps A.C. and white light; *C–F*, broken curves, response to white light.

just like the curve for yellow light (*E*). Similarly, an A.C. of 55 cps could be used as a substitute for the yellow light used in *D* (see *F*). It can be said from these experiments that an A.C. of 36 cps is equivalent to blue light, and an A.C. of 55 cps to yellow light, so far as retinal induction is concerned. From a series of such experiments we could determine functional correspondence between the frequencies of alternating currents and the wavelengths of colored lights. Thus four frequency ranges corresponding to four main colors—red, yellow, green, and blue—were estimated as follows: blue, 33–37 cps; green, 40–45 cps; yellow, 47–55 cps; red, 60–100 cps.

Let us once more survey the strength-frequency curves illustrated in Figs. 1 and 2, taking the result obtained in this experiment into account. In the curve in Fig. 2, there can be distinguished at least six minima other than the one located at about 20 cps, which ought to have no concern with color receptors, if the interpretation stated above is correct. The three minima located at about 35, 42.5, and 52.5 cps must be concerned with blue, green, and yellow receptors, respectively, because these optimal frequencies fall into the three frequency ranges determined above. For the same reason frequencies higher than 60 cps may be correlated to longer wavelengths of spectral lights. In the lower curve in Fig. 1, however, the minimum to be correlated to the green receptors is missing, and in the upper one this minimum is not so distinct as in the curve in Fig. 2. In general the minimum at about 42.5 cps tends to be obliterated. A tentative explanation for this situation may be as follows: Since it is generally much easier to perceive electrically produced flickers in the periphery and in parafoveal regions of the retina than at the fovea, the retinal elements outside the fovea are more likely to be involved in determination of thresholds than those at the fovea. On the other hand, the green receptors are known to be less active outside the fovea than the other kinds of receptors, so that the minimum for the green receptors is generally not so distinct as the minima for the other receptors. The prominence of the minima for the blue and yellow receptors may be interpreted from the same point of view (peripheral dichromatism).

As can be seen clearly in the inset of Fig. 2, the minima of our strength-frequency curves are not artifacts resulting from inaccurate measurements, as might be supposed, but physiological manifestations of the composite nature of the retina, which obviously contains several kinds of receptors characterized by their own time constants. For this reason, a strength-frequency curve may be regarded as a kind of resonance curve, and it is the principle of resonance that provides a means for selective stimulation of color receptors. The relation between the frequencies of alternating currents and the wavelengths of colored lights outlined above can be studied more precisely on the basis of the fact that each minimum deepens specifically under the action of characteristic colored light. The experimental procedure and conditions for this effect are, however, too complicated to be described in the present communication, so that only the result obtained by this method will be summarized: (1) the above-mentioned relation has been fully confirmed, (2) the minima at 77.5, 62.5, and 27.5 cps seen in Fig. 2 have been shown to correspond to red, orange, and violet, respectively.

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Manuscript received January 17, 1952.

Comments and Communications

Passports

DELAYS and denials have been such common experiences in applications for passports and visas that any statement of policy should be of some help in a situation that seems as highly classified as an atomic bomb project. It was the judgment of the Executive Committee of the AAAS, at its meeting June 28–29, that the following statement, released by the Department of State on May 24, should be published in full for such enlightenment as it may provide readers of SCIENCE who are planning trips abroad.

The Department of State has been asked what authority the Secretary of State has in regard to the issuance of passports and what the Department's policy is in regard to the denial of passports.

The following information is provided in answer to these questions:

1. The Secretary of State has discretionary authority in the issuance of passports, both as a power inherent in the exercise of the Presidential authority to conduct foreign relations and as a matter of statutory law.

2. Various Secretaries of State have exercised the right to refuse passports or withdraw passports already issued. Various courts and attorneys general of the United States have rendered opinions in which the discretionary authority of the Secretary of State in the issuance of passports has been recognized. In an opinion of August 29, 1901, the Attorney General stated:

> Substantial reasons exist for the use by Congress of the word "may" in connection with authority to issue passports. Circumstances are conceivable which would make it most inexpedient for the public interests for this country to grant a passport to a citizen of the United States. For example, if one of the criminal class, an avowed anarchist for instance, were to make such application, the public interests might require that his application be denied.
>
> Without expressing any opinion as to whether a passport should be granted to Ng Faun, I advise you that it may, in your discretion, be granted or withheld.

In the case of Perkins versus Elg, 307 U. S. 325 (1939), the Supreme Court, after holding that the Secretary of State should be included in a decree declaring the plaintiff to be a natural-born citizen of the United States, had the following to say:

> The decree in that sense would in no way interfere with the exercise of the Secretary's discretion with respect to the issue of a passport but would simply preclude the denial of a passport on the ground that Miss Elg had lost her American citizenship.

3. For many years the Department has refused passports to persons for many reasons. For example, passports are denied when evidence in the Department's files shows that the applicant for the passport is a fugitive from justice or mentally ill or likely to become a public charge abroad, etc.

4. For many years the Department has also refused passports to persons when it had in its files clear evidence that they had, on previous trips abroad, engaged in political activities in foreign countries.

5. The Department re-examined its policy respecting the issue of passports to Communists and persons believed to be Communists and subversives after both the judicial and legislative branches of the government had made certain findings concerning the Communist movement in the United States. The United States Court of Appeals for the Second Circuit, in upholding the conviction of the eleven leading Communists in New York, found that the conspiracy in which they were participants was a "clear and present danger to the United States." The Congress of the United States, in the Internal Security Act of 1950, made these findings: That there exists a world-wide Communist revolutionary movement, the purpose of which is by treachery, deceit, espionage, and sabotage to establish a Communist totalitarian dictatorship in countries throughout the world; that, due to the world-wide scope of the movement, the travel of Communist members, representatives, and agents from country to country is a prerequisite for the carrying on of activities to further the purpose of this revolutionary movement; and that individuals in the United States, by participating in this movement, in effect, repudiate their allegiance to the United States and transfer their allegiance to the foreign country which controls the Communist movement.

It was decided that, in view of the findings by the court and the Congress, it would be inappropriate and inconsistent for the Department to issue a passport to a person if information in its files *gave reason to believe* that he is knowingly a member of a Communist organization or that his conduct abroad is likely to be contrary to the best interests of the United States. This policy has been followed since February 1951 and, in view of the national emergency proclaimed by President Truman and the conditions existing in various areas of the world, it is believed that it should be closely adhered to.

6. A passport certifies to foreign governments not only the citizenship and identity of the bearer but requests them to permit him safely and freely to pass and, in case of need, to give all lawful aid and protection. Possession of the passport indicates the right of the bearer to receive the protection and good offices of American diplomatic and consular officers abroad. The right to receive the protection of this government is correlative with the obligation to give undivided allegiance to the United States. A person whose activities, either at home or abroad, promote the interests of a foreign country or a political faction therein to the detriment of the United States or of friendly foreign countries should not be the bearer of an American passport.

7. Passports are refused only on the basis of very clear and definite reports from the investigative and security offices of this Department and of other government departments and agencies and from foreign governments containing well-authenticated information concerning past and present activities and associations of the applicant. The decision not to issue a passport or to withdraw a passport already issued does not represent the judgment of the Passport Division alone but is reached after consultation by responsible officers of the Passport Division with security officers, and political and administrative officers of the Department. This group varies according to the area or areas in which the applicant desires to travel. The decision is therefore the decision of the Department.

8. Any applicant who has been refused a passport has every right and is given every opportunity to request

further consideration of his case and may present any evidence or information which he may wish to have considered. The particularity with which he may be informed of the contents of the reports in the Department's file depends, of course, upon the source and classification of such reports but it is usually possible to inform him in a general way of the nature of the evidence and the information upon which he has been refused a passport. Any new evidence or information which the applicant may submit is referred to the officers who first examined the case for evaluation and expression of opinion as to whether a passport may be issued. The Department cannot violate the confidential character of passport files by making public any information contained therein.

9. The Secretary of State has the authority to establish any administrative procedures respecting passports which he may deem appropriate. These procedures are under constant review and a continuing effort is made to see that they are fair and efficient. There is a board in the Passport Division for questions of loss of nationality. The consultations between officers of the Passport Division and officers of other divisions of the Department and with the Foreign Service abroad, in effect, constitute in a given case a most fair and comprehensive board of review action in the denial of a passport in the interests of the United States.

An Improved Lyophilizer[1]

THE lyophilization of bacterial cultures is a common laboratory practice. The apparatus, however, is often inefficient, fragile, and costly. We have tried several designs and have finally developed a type that is highly efficient, very sturdy, and inexpensive (Fig. 1).

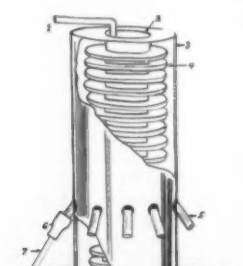

FIG. 1.

In essence, it is a metal Dewar flask with 24 nipples (5), ½″ × 2″, welded to the sides for the attachment of culture-drying vials. A steel pipe (2), 23″ × 3″, was welded in the center of a 24″ × 7½″ tank. Before the pipe was attached, metal fins ¼″ × 1½″ were welded to the inside of the tank. The vacuum exhaust pipe (1), ½″ × 23″, which was attached to the inside of the condenser pipe (2), acts as a second trap, removing any moisture before it reaches the vacuum pump.

[1] Published with approval of the director, Wyoming Agricultural Experiment Station, as Journal Paper No. 17.

It is important that all joints be welded and not brazed, if all leaks are to be eliminated. If brass parts are used throughout, brazing is permissible.

Ethyl alcohol or a 50% ethylene glycol–water mixture is used as a carrier in the condenser chamber (2) with a dry-ice refrigerant. The doughnut-shaped pan (8), a separate unit 22″ OD by 12″ ID, is constructed to conform to the tank shape (3). The pan (8) is then filled with ethylene glycol. The glass culture tubes (7) are connected to the metal nipples (5) by means of heavy rubber vacuum tubing (6).

The dimensions given are not critical but have been found satisfactory. Efficiency of this design lies in the great condenser surface and the short distance from condenser to culture tubes.

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University of Wyoming

Sterilization of Pyrogen-Free Injections in Fenwal Bottles

STEAM under pressure is usually employed to sterilize material for injection not injured by moisture and the temperature required. But when applied to material in Fenwal bottles[1] or containers not hermetically sealed, this process is unsatisfactory. There is a source of contamination that has been neglected.

At the beginning of sterilization, the temperature of the material is raised by the heat conducted through the container wall to 100° C. As a result, the air and water vapor inside the container increase in pressure and blow off continuously through the vent in the cap. No obvious drawback is seen here. During the change of temperature from 100° C to 120° C the steam pressure outside increases and remains greater than that of the gas mixture inside the container. Consequently, the steam outside will continuously enter the container and condense therein. For example, if a 1000-cc Fenwal bottle is used and 3 or 4 min are needed for the temperature to rise from 100° C to 120° C the total heat required will be 20,000 calories. The heat conducted through the wall[2] is at most 1000 calories. The greater amount of heat, therefore, must come from the condensation of steam, which is calculated to be at least 35 g. It is this amount of condensate that may spoil the material destined for injection.

To avoid contamination of the pyrogen-free solutions in Fenwal bottles during sterilization the following three processes are recommended:

Method I. Use the autoclave with the author's device (SCIENCE, 113, 488 [1951]). Heat the solutions by free-flowing steam to a temperature of 100° C within

[1] Supplied by the Macalaster Bicknell Company, Cambridge, Mass.

[2] Calculated from the equation $H = \frac{kA(t_1 - t_2)}{d}$, where H = heat transmitted per sec, k = heat conductivity of glass = 0.0020, A = area = 400 cm², $t_1 - t_2$ = temperature difference, d = thickness = 0.2 cm.

at least 10 min,[3] to displace the air in the bottles by water vapor. Seal them by pushing down the caps and sterilize under pressure.

Method II. First heat and seal the solutions as in Method I. Then sterilize by means of free-flowing steam sterilization.

Method III. Seal the solutions hermetically and sterilize by means of steam under pressure or free-flowing steam sterilization.

Method I is the quickest, most effective, and most reliable process among the three, but the solutions are slightly contaminated by the steam diffused through the vent at the beginning, and care must be taken not to blow out the caps. Method II is the easiest in practice, but the solutions will be slightly contaminated in this process, too. Method III is the best from the standpoint of contamination, but in operation it is rather difficult if Fenwal bottles with old rubber stoppers are used.

CHEN LU-AO

National Defense Medical Center
Taipei, Taiwan, China

[3] Time required for enough heat to transfer through the wall to heat the solution inside.

Association Affairs

Hotel Headquarters, Sixth St. Louis Meeting December 26–31, 1952

R. L. Taylor

Assistant Administrative Secretary

ONE of the fundamental reasons scientists attend scientific meetings is to take advantage of the opportunity to renew contacts with former colleagues, professors, and students—and to meet, and exchange opinions with, other workers in the same fields of science. A AAAS meeting has an additional, unique advantage in that research workers in different disciplines are brought together. The basic pattern of the housing and session room arrangements, however, is the logical one of grouping specialists and closely related organizations together. Thus a large participating society is assigned an individual hotel, where the integrity of its own sessions is assured, and cooperating societies with joint sessions usually share the same hotel. Societies in closely related fields of science generally have headquarters hotels that are close together, to make it easier for those who wish to attend parts of concurrent sessions. AAAS sections are similarly grouped.

At the 119th Meeting of the AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE in St. Louis, December 26–31, 1952, this plan has been followed. As indicated in the Preliminary Announcement of this Sixth St. Louis Meeting (SCIENCE, 115, 592 [1952]), the center of the week's activities will be the Kiel Auditorium, within a few blocks of all the downtown hotels—the Jefferson, Statler, De Soto, Lennox, Mayfair, and Mark Twain. This modern, well-equipped convention hall will be the site of the general symposia; the sectional programs in physics, chemistry, geology and geography, botany, psychology, the social sciences and agriculture, engineering, medical sciences (including medicine, dentistry, and pharmacy), and industrial science; the sessions of the Oak Ridge Institute of Nuclear Studies and of the Conference on Scientific Manpower II; the Annual Lecture of the National Geographic Society, and the Biologists' Smoker, both on the evening of December 29. The physical relationships of the Kiel Auditorium's session rooms, the Main Registration, the Visible Directory of Registrants, the AAAS Science Theatre, and the Annual Exposition of Science and Industry are almost ideal.

The Jefferson Hotel, AAAS headquarters, will be the locale of such evening events as the Phi Beta Kappa Annual Address, December 27; the AAAS Presidential Address, December 28; the Sigma Xi Annual Address, December 29; and the Annual Address of the Scientific Research Society of America, December 30. It will also have the sessions of the Academy Conference and of certain sections and societies (see tabulation at end of article). The Statler will be headquarters for AAAS Section F, the Society of Systematic Zoology, and, in general, all biological and medical groups. The science teaching societies will occupy the Hotel De Soto.

The three mathematical societies will hold all their sessions on the campus of Washington University and will be housed in the hotels most convenient for them—i.e., the Roosevelt, Chase, Melbourne, and Sheraton. With the exception of these hotels, which are reserved for the mathematicians and which are two to four miles west of downtown St. Louis, all the hotels that will be used are within a few blocks of each other and within a few minutes' walking distance of the Kiel Auditorium.

The hotels of St. Louis have pledged themselves to provide ample housing at moderate rates for those attending the meeting. Housing will be handled by the experienced, efficient St. Louis Convention Bureau. Hotel room assignment–confirmation slips are typed in triplicate, and one of these will be sent directly to the applicant by the hotel. Those who apply early are assured the hotel of their first choice, but it must be remembered that the supply of single rooms, at single rates, is always relatively limited—it pays to apply early for them. Double rooms for single occupancy,

which carry a higher rate, are more plentiful. There is no shortage of rooms, as in the spring of 1946, when wartime conditions still prevailed. Expenses can always be reduced if rooms or suites are shared with one or more colleagues or friends.

Beginning with this issue, the advertising section of SCIENCE will carry page announcements of the hotels and their current rate schedules, together with a coupon which should be filled out and sent, ***not to a hotel,*** but to the AAAS Housing Bureau in St. Louis. Applications for hotel reservations will be filled in the order of their receipt.

Individuals of course have freedom of choice of hotels, but, in stating their preference, the desired rate, and the maximum rate, it is natural that those who apply latest may not secure their first choice of hotels. Usually a person's preference is for the hotel that has been named as headquarters for his section or society. For the convenience of those planning to attend the 119th Meeting of the Association, the headquarters for the 18 sections and subsections and the 30-odd participating societies are listed below:

HOTEL HEADQUARTERS

Downtown Zone

Jefferson: (800 rooms) 415 N. 12th St.	AAAS; Press; AAAS Sections B, C, D, E, H, I, K, L, M, P, and Q; Academy Conference; American Meteorological Society, Oak Ridge Institute of Nuclear Studies; Alpha Chi Sigma; Geological Society of America, National Geographic Society; American Statistical Association, National Academy of Economics and Political Science, Pi Gamma Mu; History of Science Society, Philosophy of Science Association; Association of American Railroads; American Industrial Hygiene Association, Society for Industrial Microbiology; American Geophysical Union, Conference on Scientific Manpower, National Association of Science Writers, Scientific Research Society of America, Society of the Sigma Xi, United Chapters of Phi Beta Kappa.
Statler: (650 rooms) 822 Washington Ave.	AAAS Sections F, G, Nm, Nd, Np, and O; National Speleological Society; Herpetologists League, Society of Systematic Zoology; American Society of Naturalists, Biometric Society, Ecological Society of America; American Society of Plant Physiologists, Mycological Society of America; Alpha Epsilon Delta, American Academy of Forensic Sciences, American Association of Hospital Consultants, American College of Apothecaries, American Physiological Society, American Psychiatric Association, American Society of Hospital Pharmacists, Scientific Section of American Pharmaceutical Association.
De Soto: (300 rooms) 1014 Locust St.	AAAS Cooperative Committee; National Association of Biology Teachers; National Science Teachers Association; American Nature Study Society.

The following additional hotels, and others, are available for sleeping rooms:

Lennox (350 rooms), 825 Washington Ave.
Mark Twain (300 rooms), 116 N. 8th St.
Mayfair (350 rooms), 806 St. Charles St.

Hotels for the Mathematicians (Not Downtown)

Chase 212 N. Kingshighway	
Roosevelt 4903 Delmar Blvd.	AAAS Section A; American Mathematical Society, Association for Symbolic Logic, Mathematical Association of America.
Melbourne 3601 Lindell Blvd.	
Sheraton 3701 Lindell Blvd.	

ADVANCE REGISTRATION AND ADVANCE COPIES OF THE GENERAL PROGRAM-DIRECTORY

As in past years, those who plan to attend the meeting may register in advance and receive both a Convention Badge and a copy of the General Program-Directory, by first-class mail, early in December. The registration fee of $2.50 includes postage. Those who cannot attend the meeting but would like an advance copy of the General Program, the directory content of which has been increased, may also obtain it by first-class mail early in December at cost—$1.50. A coupon covering both alternatives will be found on another page in the advertising portion of this issue of SCIENCE. The appropriate square should be checked.

SECTIONAL SESSIONS FOR CONTRIBUTED PAPERS

The following AAAS sections will receive papers. A brief abstract should accompany each title, and these should be sent to the section secretary or program chairman ***not later than September 30***—preferably earlier.

C, Chemistry—Ed. F. Degering, 1860 Colonial Dr., Memphis 7, Tenn.
E, Geology and Geography—Leland Horberg, Department of Geology, University of Chicago, Chicago 37
F, Zoological Sciences—Waldo Schmitt, U. S. National Museum, Washington 25, D. C.
G, Botanical Sciences—Stanley A. Cain, School of Natural Resources, University of Michigan, Ann Arbor
H, Anthropology—Gabriel Lasker, Wayne University College of Medicine, 1512 St. Antoine St., Detroit 26
I, Psychology—Delos D. Wickens, Department of Psychology, Ohio State University, Columbus 10
L, History and Philosophy of Science—Raymond J. Seeger, 4507 Wetherill Rd., Washington 16, D. C.
Nd, Dentistry—Russell W. Bunting, School of Dentistry, University of Michigan, Ann Arbor
Np, Pharmacy—George F. Archambault, U. S. Public Health Service, Washington 25, D. C.
Q, Education—Dean A. Worcester, University of Nebraska, Lincoln

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GET YOUR ADVANCE COPY

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By first class mail – early in December

The General Program-Directory of the 119th Meeting of the AAAS in St. Louis, December 26–31, 1952, will be available to anyone, at cost, within the first week in December—whether he can attend the Meeting or not. This year the General Program will be much simplified in format and the Directory content increased. You will want it for your reference shelf.

Program content

1. The General Symposia: "Disaster Recovery" and "The Nation's Nutrition."
2. Programs of the 18 AAAS sections and subsections (symposia and contributed papers).
3. Programs of the more than 30 participating societies.
4. The Special Sessions: AAAS, Academy Conference, Conference on Scientific Manpower II, National Geographic Society, Phi Beta Kappa, RESA, Sigma Xi.
5. Details of the Kiel Auditorium, downtown hotels, Washington University.
6. Titles of the latest scientific films to be shown in the AAAS Science Theatre.
7. Exhibitors in the 1952 Annual Exposition of Science and Industry and descriptions of their exhibits.

Directory content

1. AAAS officers and staff for 1952.
2. Complete roll of AAAS presidents and their fields.
3. The 236 affiliated organizations.
4. Historical sketch and organization of the Association.
5. Publications of the Association.
6. AAAS Awards and Grants—including all past winners.
7. Membership figures by sections.
8. Section committees (Council members) in detail.
9. Local committees.
10. Future Meetings of the AAAS.

Advance Registration

Advance registration—if you *can* attend the Meeting—has these advantages: 1) You avoid delay at Registration Desks upon arrival; 2) You receive the General Program-Directory in ample time, unhurriedly, to decide among events and sessions you particularly wish to attend; 3) Your name is posted in the Visible Directory as the Meeting opens.

The coupon below may be used both by advance registrants and by those who wish only the advance copy of the General Program-Directory.

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APPLICATION FOR HOTEL RESERVATIONS

119th AAAS MEETING

St. Louis, Mo., December 26-31, 1952

The list of hotels and their rates and the reservation coupon below are for your convenience in making your hotel room reservation in St. Louis. Please send your application, *not* to any hotel directly, but to the AAAS Housing Bureau in St. Louis and thereby avoid delay and confusion. The experienced Housing Bureau will make assignments promptly; a confirmation will be sent you in two weeks or less. **Share a room with a colleague if you wish to keep down expenses.** Mail your application *now* to secure your first choice of desired accommodations. All requests for reservations must give a definite date and estimated hour of arrival, as well as date and approximate hour of departure.

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Hotel★	Single	Double Bed	Twin Beds	Suites
CHASE	6.00– 9.00	8.00–10.00	8.00–12.00	14.00–30.00
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MAYFAIR D	4.00– 7.00	5.50– 8.00	8.00–12.00	15.00 & up
MELBOURNE	4.50– 8.00	6.50– 8.50	8.50–11.00	17.00–25.00
ROOSEVELT	Reserved for mathematicians, $2.75 to $3.75 per bed.			
SHERATON	5.25– 8.85	8.00–11.00	9.00–12.50	11.00–30.00
STATLER★D	4.00– 7.00	6.50– 9.50	7.50–11.00	21.50–26.50

★ **Hotels starred have sessions in their public rooms.** For a list of the headquarters of each participating society and section, please see Association Affairs, *Science*, July 25, or *The Scientific Monthly*, August.

D = downtown hotel; the other hotels (not downtown) are for the mathematicians primarily.

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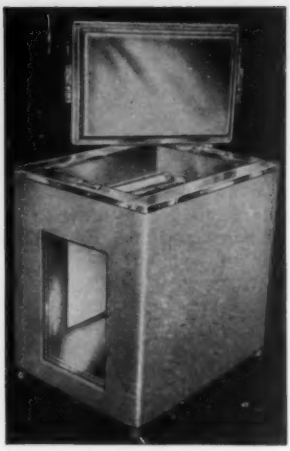

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Aug. 15–22. International Conference of Agricultural Economists. East Lansing, Mich.
Aug. 17–23. American Pharmaceutical Association. Hotel Bellevue-Stratford, Philadelphia.
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Aug. 18–22. Seminar in Industrial Instrumentation. Minneapolis-Honeywell Regulator Company, Philadelphia.
Aug. 19–22. American Institute of Electrical Engineers (Pacific General). Hotel Westward Ho, Phoenix, Ariz.
Aug. 20–27. Australian and New Zealand Association for the Advancement of Science (Annual). Sydney.
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Aug. 25–30. World Federation for Mental Health (Annual). Brussels.
Aug. 31–Sept 7. Interamerican Cardiological Congress. Buenos Aires.
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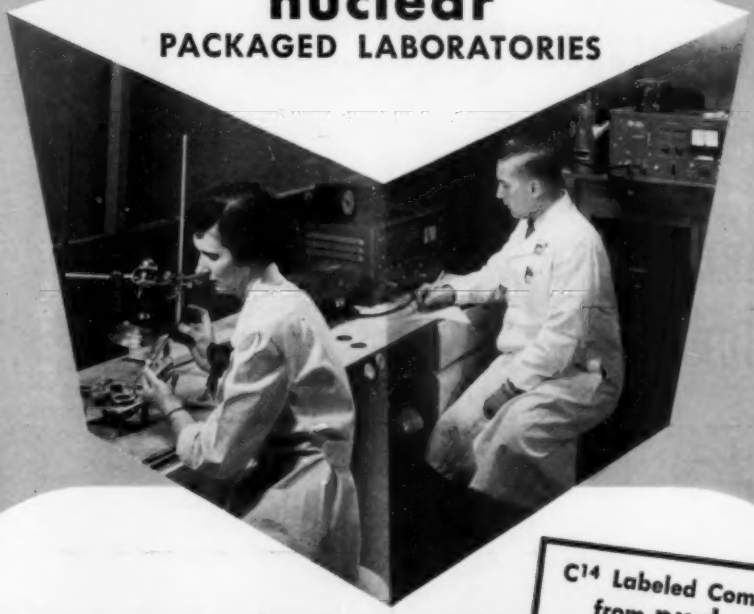

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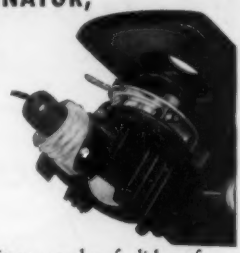

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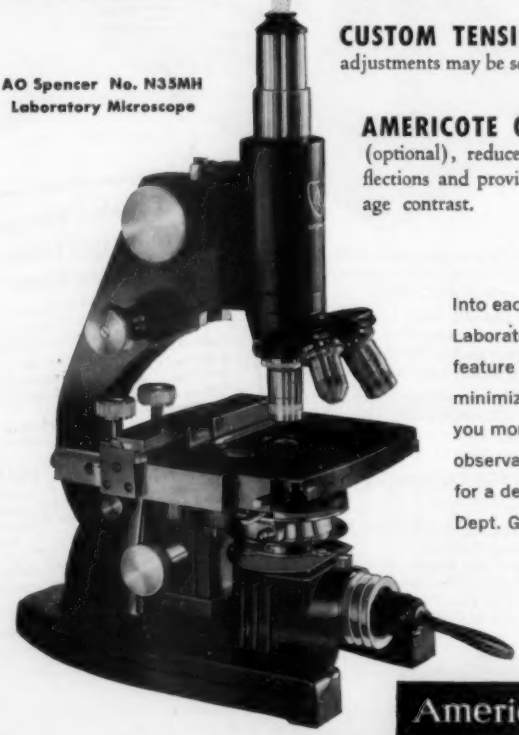

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